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August 9, 2018

British Columbia Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC, V6Z 2N3
Attn: Patrick Wruck, Commission Secretary
By Web Posting

Dear Sir:

Re: FortisBC Energy Inc. 2017 Long Term Gas Resource Plan ~ Project No.1598946
BC Sustainable Energy Association and Sierra Club BC, Evidence

Pursuant to the regulatory timetable set out in Order G-132-18,¹ attached please find intervenor evidence by James Grevatt, Energy Futures Group, filed by BCSEA-SCBC in this proceeding.

Yours truly,

William J. Andrews



Barrister & Solicitor
Encl.

¹ Exhibit A-7.

BRITISH COLUMBIA UTILITIES COMMISSION

FortisBC Energy Inc.
2017 Long Term Gas Resource Plan
BCUC Project No. 1598946

Testimony of James Grevatt, Energy Futures Group, Inc.

For

B.C. Sustainable Energy Association and Sierra Club B.C.

August 9, 2018

I. Introduction and Summary

BC Sustainable Energy Association and Sierra Club BC (BCSEA-SCBC) retained Jim Grevatt, Energy Futures Group, Inc. (EFG), to review and analyze FEI's 2017 Long Term Gas Resource Plan (LTGRP) in order to determine if there are opportunities for FEI to increase the benefits it provides to ratepayers and to the Province through its DSM initiatives.

Mr. Grevatt has provided expert review of programs in Maryland, Pennsylvania, Mississippi, New Hampshire, Colorado, Nevada, Kentucky, North Carolina, and Maine, as well as in recent FortisBC and BC Hydro cases, and currently leads strategic planning for the New Jersey Clean Energy Program for EFG. He brings 25 years' leadership experience in energy efficiency program operations to his consulting practice. As Director of Residential Energy Services for Efficiency Vermont for over five years, and then in the same role for the District of Columbia Sustainable Energy Utility for its startup operation, Mr. Grevatt has hands-on experience with industry-leading markets-based approaches to managing energy efficiency programs, including multi-family, low income, residential retrofit, new construction, HVAC, and efficient products programs. Mr. Grevatt's CV is attached as Appendix A.

Based on its review and analysis, EFG has identified opportunities for Fortis to improve its approach to DSM planning in the following areas:

- 1. FEI's LTGRP does not include a specific plan or timeline for determining the potential to use DSM savings to defer capital infrastructure. To ensure FEI's ability to assess the viability of capacity-focused DSM alternatives in advance of the forecast date of any capacity gap, FEI should prepare a study plan and timeline. The BCUC should not be 'forced' to approve supply-side investments that could have been deferred through DSM if FEI had completed its analysis of DSM alternatives in a timely fashion.**
- 2. FEI's approach to developing its "Reference Case" DSM savings trajectory is inadequate. FEI relies on the Conservation Potential Review by Navigant Consulting Ltd., which rejects "Maximum Achievable Savings" and instead**

provides savings estimates of “Market Potential.” This leaves an information gap that causes the DSM savings projection in the “Reference Case” to be overly conservative (low) because the full scale of available savings is not considered.

II. Detail

A detailed explanation of EFG’s findings follows.

- 1. FEI’s LTGRP does not include a specific plan or timeline for determining the potential to use DSM savings to defer capital infrastructure. To ensure FEI’s ability to assess the viability of capacity-focused DSM alternatives in advance of the forecast date of any capacity gap, FEI should prepare a study plan and timeline. The BCUC should not be ‘forced’ to approve supply-side investments that could have been deferred through DSM if FEI had completed its analysis of DSM alternatives in a timely fashion.**

FEI states that “The 2017 LTGRP presents a long term view of the demand- and supply-side resources identified to meet expected future natural gas demand and reliability requirements at the lowest reasonable cost to FEI’s customers over the 20-year planning horizon (2017-2036).”¹ It further states that “Growth in peak demand is among the most significant challenges for FEI’s long term planning.”² In light of FEI’s acknowledgment of the critical need for risk management regarding peak demand resources, it is notable that FEI fails to provide a concrete plan and timeline for assessing the potential to use DSM as a cost-effective alternative to traditional capacity resources. Rather, FEI states that it “has not conducted analysis addressing above Plan DSM to address any of VITS, CTS, or ITS constraints” and that it “is developing the means to conduct such an analysis.”³ Further, FEI states that “many years will be required to establish the measurement solutions and develop the end-use method to a point where a

¹ Exhibit B-1, FEI LTGRP, pdf p.13, lines 5-7.

² Exhibit B-1, FEI LTGRP ES-7, lines 21-22.

³ Exhibit B-3, BCSEA IR 1 response 5.3

reliable determination of the impacts of DSM on peak demand projections and capacity related infrastructure investments can be made.”⁴

FEI’s failure to date to establish a specific plan and timeline for addressing DSM as a cost-effective alternative to traditional capacity resources may be related to its position that “measures that rely on voluntary participation are considered too uncertain for planning of infrastructure projects designed to ensure capacity to meet peak demand under very infrequent and severely cold weather conditions.”⁵ This position, however, is unsupportable. Demand reduction is not limited to voluntary measures. Reliability risk can be addressed effectively. For example, a report produced by the Northeast Energy Efficiency Partnerships (NEEP) described Con Edison’s use of binding contracts for demand reduction in the early 2000’s:

For these early projects, the Company chose to contract out the acquisition of demand resources to energy service companies (ESCOs). To address reliability risks its contracts contained both “significant upfront security and downstream liquidated damage provisions”, as well as rigorous measurement and verification requirements, including 100% pre- and post-installation inspections.⁶

FEI’s perception that DSM demand measures are inherently too risky for planning purposes is not supported by Con Edison’s successful experience in using DSM to defer infrastructure investments:

“...using DSM to defer projects bought time for demand uncertainty to resolve, leading to better capital decision making. Moreover, widespread policy and cultural shifts favoring energy efficiency may further defer some projects to the point where they are never needed... In fact, Con Edison has projected that in the

⁴ Exhibit B-3, FEI response to BCSEA IR 1.23.3.1, pdf p.61 (underline added).

⁵ Exhibit B-2, FEI response to BCUC IR 1.29.4, pdf p.144.

⁶ Neme, Chris, and Grevatt, Jim: Energy Efficiency as a T&D Resource: Lessons from Recent U.S. Efforts to Use Geographically Targeted Efficiency Programs to Defer T&D Investments. The Northeast Energy Efficiency Partnerships, 2015. p. 27 <http://www.neep.org/energy-efficiency-transmission-and-distribution-resource-using-geotargeting>.

absence of this program it would have installed up to \$85 million in capacity extensions that may never be needed.”⁷

By relying on firm contracts for demand response, Con Edison was able to save money for its customers by using DSM to defer infrastructure investments that it later concluded might never have been needed.

FEI suggests that assessment of the potential for DSM to reduce peak demand must be grounded in experience. This is reasonable. FEI identifies a number of practical steps it can take to gather data to support an improved technical foundation for future modeling. The modeling approach that FEI describes in the Application Section 6.2.1.3 is also a step forward.

However, the Company’s statement that it “intends to continue to explore means to verify the model results and refine the inputs to the method with the objective of creating a reliable tool for analysis”⁸ fails to provide reassurance about when this work will be completed. Similarly, FEI does not commit to completing an assessment of capacity DSM opportunities before proposing ratepayer investments in capacity that potentially could be deferred through cost-effective DSM.

FEI’s ratepayers will be best-served by a defined plan and timeline for assessing DSM’s potential as a tool for deferring capacity investments. The plan should include identification of technical approaches for measuring and mitigating peak capacity demand growth through DSM and should also identify specific pending constraints that have the potential to be addressed through DSM. The objective is to prevent the possibility of the BCUC being asked to approve traditional capacity investments in the absence of evidence of whether capacity DSM would be a more cost-effective alternative.

Regulators in other jurisdictions have imposed planning requirements on utilities to prevent “forced” approval of costly infrastructure investments when timely analysis of

⁷ Gazze, Chris et al., “Con Ed’s Targeted Demand Side Management Program: Replacing Distribution Infrastructure with Load Reduction”, in Proceedings of the ACEEE 2010 Summer Study on Energy Efficiency in Buildings, Volume 5, pp. 117-129.

⁸ Exhibit B-3, FEI response to BCSEA IR 1.5.3, pdf p.11.

DSM options could have provided cost-effective alternatives that would have reduced ratepayer costs. For example, the Ontario Energy Board addressed Future Planning for Enbridge and Union in its decision in the Greater Toronto Area gas pipeline proceeding in 2014. Intervener evidence had suggested that aggressive DSM could have potentially deferred a portion of the expansion proposed in that proceeding. The OEB determined as follows:

In light of the evidence presented, the Board concludes that further examination of integrated resource planning for gas utilities is warranted. The evidence in this proceeding demonstrates that the following issues should be examined:

- The potential for targeted DSM and alternative rate designs to reduce peak demand
- The role of interruptible loads in system planning
- Risk assessment in system planning, including project prioritization and option comparison
- Shareholder incentives

There will undoubtedly be other issues as well. The Board notes that this review is particularly timely given the recent provincial Long Term Energy Plan. Further information on how the Board will examine gas integrated resource planning will be released in due course.

Pending that review, the Board expects applicants to provide a more rigorous examination of demand side alternatives, including rate options, in all gas leave to construct projects.⁹

Following the issuance of its reasons for decision quoted above, the OEB established a new gas infrastructure planning framework that requires gas utilities to analyze capacity DSM opportunities and to implement cost-effective capacity DSM ahead of infrastructure investments. The framework states:

13.0 FUTURE INFRASTRUCTURE PLANNING ACTIVITIES

As part of all applications for leave to construct future infrastructure projects, the gas utilities must provide evidence of how DSM has been considered as an alternative at the preliminary stage of project development.

⁹ Ontario Energy Board, Decision and Order, January 30, 2014, EB-2012-0433, EB-2013-0074, EB-2012-0451, , pdf pp 52-53 (underline added),
<http://www.rds.oeb.ca/HPECMWebDrawer/Record/424174/File/document>.

In order for the gas utilities to fully assess future distribution and transmission system needs, and to appropriately serve their customers in the most reliable and cost-effective manner, the Board is of the view that DSM should be considered when developing both regional and local infrastructure plans. This is consistent with the direction outlined in the LTEP and the Conservation Directive, which state that the Board shall take steps it considers appropriate towards implementing the government's policy of putting conservation first in electricity distributor and gas distributor infrastructure planning processes at the regional and local levels, where cost-effective and consistent with maintaining appropriate levels of reliability. The Board expects the gas utilities to consider the role of DSM in reducing and/or deferring future infrastructure investments far enough in advance of the infrastructure replacement or upgrade so that DSM can reasonably be considered as a possible alternative. If a gas utility identifies DSM as a practical alternative to a future infrastructure investment project, it may apply to the Board for incremental funds to administer a specific DSM program in that area where a system constraint has been identified.¹⁰

The OEB also required the gas utilities to conduct studies on the opportunities for DSM in system planning:

The Board is also of the view that the gas utilities should each conduct a study, completed as soon as possible and no later than in time to inform the mid-term review of the DSM framework. The studies should be based on a consistent methodology to determine the appropriate role that DSM may serve in future system planning efforts. As part of the multi-year DSM plan applications, the gas utilities should include a preliminary scope of the study it plans to conduct and propose a preliminary transition plan that outlines how the gas utility plans to begin to include DSM as part of its future infrastructure planning efforts.¹¹

The OEB has since more specifically directed Ontario's gas utilities to accelerate development of their approach to addressing DSM in their planning activities:

The OEB recognizes the challenge that it has given the gas utilities, to avoid new build by implementing selectively targeted DSM. The OEB agrees that a case study, as proposed by Enbridge, would assist in assessing the merits of a transition plan. However, the OEB is concerned that the time required to complete

¹⁰ Ontario Energy Board, Demand Side Management Framework for Natural Gas Distributors (2015-2020), Report of the Board, EB-2014-0134 (OEB Gas DSM Framework), pdf pp. 39-40 (underline added), https://www.oeb.ca/sites/default/files/uploads/Report_Demand_Side_Management_Framework_20141222.pdf

¹¹ *Ibid.* (underline added).

a case study would delay the utilities' infrastructure planning activities proposal and the transition plan would not be available in time for the mid-term review.

The OEB directs Enbridge and Union to work jointly on the preparation of a proposed transition plan that outlines how to include DSM as part of future infrastructure planning activities. The utilities are to follow the outline prepared by Enbridge, and should consider the enhancements suggested by the intervenors and expert witnesses. The transition plan should be filed as part of the mid-term review.¹²

The Vermont Public Service Board addressed this topic in its Order approving the so-called "Northwest Vermont Reliability Project." The Board stated that:

...we are deeply troubled that, in the present case, we have no viable option but to approve a transmission solution for a reliability problem that might have been either deferred or more cost-effectively addressed through demand-side measures or local generation, if there had been sufficient advance planning....¹³

It would be consistent with emerging best practices for the BCUC to direct FEI to provide evidence of how DSM has been considered as an alternative at the preliminary stage of project development for any anticipated capacity-driven infrastructure investments. To ensure that FEI is able to provide such evidence, and that it is grounded in reliable analysis, the BCUC could direct FEI to develop a plan and timeline in short order to conduct an analysis of the potential peak-reducing benefits of DSM. The analysis would provide the requisite data to allow FEI to analyze DSM alternatives to infrastructure investment before it comes to the BCUC with any applications for approval of capacity-related investments.

Completing this analysis, and adequately assessing the opportunity to employ DSM alternatives to infrastructure investment, is required to ensure that ratepayers receive the safe and reliable utility service that FEI is required to provide in the most cost-effective manner. FEI's failure to complete such analyses risks imposing unnecessary costs on ratepayers.

¹² Ontario Energy Board, Decision and Order, EB-2015-0029, EB-2015-0049, , pdf p.89 (underline added), <http://www.rds.oeb.ca/HPECMWebDrawer/Record/513656/File/document>.

¹³ Vermont Public Service Board, Docket 6860, Order of 1/28/05 at 11. <https://epuc.vermont.gov/?q=downloadfile/209968/38913>

2. FEI’s approach to developing its “Reference Case” DSM savings trajectory is inadequate. FEI relies on the Conservation Potential Review by Navigant Consulting Ltd., which rejects “Maximum Achievable Savings” and instead provides savings estimates of “Market Potential.” This leaves an information gap that causes the DSM savings projection in the “Reference Case” to be overly conservative (low) because the full scale of available savings is not considered.

The British Columbia Conservation Potential Review (“CPR”)¹⁴ is one of the key data sets considered in the development of FEI’s 2017 LTGRP. FEI states that it “has estimated C&EM expenditures and energy savings from all cost effective measures identified through the Company’s results from the BC Conservation Potential Review (BC CPR) study.”¹⁵ The CPR provides estimates of energy savings potential in several categories, including Technical, Economic, and Achievable Market Potential, and does so under the Reference Case, Upper Bound, and Lower Bound scenarios. Unfortunately, this does not provide complete information for the BCUC to use in assessing whether or not FEI is proposing to pursue the optimum amount of energy efficiency savings through its C&EM programs.

There are two distinct reasons why the approach used by Navigant in the CPR fails to provide the BCUC with a complete picture of the maximum available cost effective savings: (1) the CPR does not attempt to quantify the “Maximum Achievable” savings that are available; and (2) potential studies are inherently conservative.

1. The CPR does not attempt to quantify the “Maximum Achievable” savings that are available.

FEI states that its DSM analysis “incorporates all cost effective demand-side measure activity,” implying that it is pursuing all the cost-effective savings that are available. However, the “Market Potential” forecast that FEI uses as a basis for its reference case DSM forecast clearly falls short. This is demonstrated by FEI’s analysis of how the

¹⁴ Exhibit B-1, Appendix C-1, pdf p.347.

¹⁵ Exhibit B-1, FEI LTGRP ES-4 lines 25-26, ES-5 line 1 (underline added).

assumed level of incentive spending impacts forecast portfolio level C&EM expenditures and energy savings.¹⁶ This sensitivity analysis showed that annual savings under the assumed Baseline Incentive DSM scenario (which corresponds to the reference case and the Market Potential Forecast) are substantially less than the amount of cost-effective annual savings that would be captured under the Highest Incentive scenario. FEI states that “the Highest Incentive scenario—having aggregate incentives that are 44% higher than the Baseline Incentive scenario—results in 2035 annual savings that are 34% higher than the Baseline Incentive scenario.”¹⁷ This shows that FEI’s Reference Case DSM scenario, based on the CPR Market Potential, does not include all cost-effective DSM savings.

All energy efficiency potential studies, including the BC CPR Market Potential Forecast, include numerous assumptions. Many of these assumptions materially impact the estimates of potential and may not reflect best practices for pursuing all cost effective energy savings. In describing the process of distilling the economic potential into the market potential, the company states:

“Market potential represented the cost-effective addressable potential that C&EM programs could pursue, while recognizing constraints imposed by likely market conditions (e.g., equipment turnover rates, incentive levels, consumer willingness to adopt, etc.). Since this analysis does not consider specific program design or delivery mechanisms, one cannot conclude that actual C&EM programs will, in practice necessarily capture this addressable potential.”¹⁸

Even though this framing implies that the Market Potential forecast represents all cost effective savings, it clearly does not. Further, it is equally true and important to note that actual C&EM programs that are designed to maximize the amount of cost effective DSM savings captured may produce significantly more savings than is suggested by the Market Potential Forecast.

Incentive levels and consumer willingness to adopt measures are two examples of factors that are within the realm of influence of C&EM programs. As FEI has

¹⁶ Exhibit B-1, FEI LTGRP p.ES-5 lines 15-17.

¹⁷ Exhibit B-3, FEI response to BCSEA-SCBC IR 1.22.1, pdf p.59 (underline added).

¹⁸ Exhibit B-3, FEI response to BCSEA-SCBC IR 1.18.1, pdf p.39, lines 27-32 (underline added).

demonstrated in its sensitivity analysis, higher incentives will lead to significantly higher cost effective savings. Similarly, developing program outreach and messaging so as to maximize savings, coupled with an easy and effective participation process, can lead to increased savings by increasing customers' willingness to adopt high efficiency measures. However, such a delivery/incentive scenario is not presented in the LTGRP. This leaves the BCUC without a complete picture of what FEI would be able to achieve—the Maximum Achievable Potential—were it to design and implement its C&EM programs to maximize the capture of cost effective savings.

Unlike the BC CPR, many potential studies include an assessment of maximum achievable savings, which is generally understood to represent an upper bound to the amount of savings that programs that are designed with the intention of capturing all cost effective savings will achieve with high incentives and wide-reaching marketing and outreach campaigns. This provides regulators with better information to use in determining appropriate savings targets, based on the applicable statutes and regulations. Recent potential studies in other jurisdictions do include assessments of Maximum Achievable Potential. For example, the Assessment of Iowa's Energy Efficiency Potential¹⁹ estimated Technical, Economic, Achievable (Business as Usual+), and Maximum Achievable potentials, as shown in the following figure:

¹⁹ Assessment of Iowa's Energy Efficiency Potential, Prepared by: Dunsky Energy Consulting with Michaels Energy and Opinion Dynamics Corporation, September 25, 2017, Filed with the Iowa Utilities Board, on November 1, 2017, EEP-2017-0001, <https://efs.iowa.gov/cs/groups/external/documents/docket/mdax/njux/~edisp/1651110.pdf>.

Figure 11: 10-Year Statewide Gas Potentials as Portion of Total Sales by Sector



Figure 1: Iowa 10-year Statewide Gas Potentials as Portion of Total Sales by Sector²⁰

In the Iowa potential study, the Maximum Achievable potentials are roughly 50% greater than the Achievable potentials. The difference between the two is due to assumptions regarding incentive levels, effectiveness of program marketing and outreach, and so on – and many of these factors can be modified to increase or decrease program savings during program design. For FEI’s Reference long-term plan to include “all cost effective savings” it would need to be consistent with an assessment of the Maximum Achievable Potential.

2. Potential studies are inherently conservative.

The second reason that the BC CPR may not provide the BCUC with a full picture of the available savings for FEI is the inherent conservatism of potential studies that are calibrated to historic program achievements rather than to assessments of the savings that could be produced under the best program designs and implementation practices. I discuss this issue in recent testimony I authored on behalf of the (US) Sierra Club and Natural Resources Defense Counsel in the Colorado Public Utilities Commission’s recent “Strategic Issues” proceeding in which the Public Service Company of Colorado’s

²⁰ *Ibid.*, Figure 11, p xxv, pdf p.25.

(PSCo) energy savings targets for the next five years were established. The testimony states:

...the fact that assumptions may be widely available, or even common in an industry, does not mean that they will accurately predict the savings that are available. Indeed, the Regulatory Assistance Project (RAP) published a report on (energy savings) potential studies that found that “even within the realm of achievable savings, there can be a range of projected savings depending on what assumptions are used, especially those regarding possible future budget constraints and related funding streams that may support energy efficiency programs.” If the assumptions used to determine achievable potential are calibrated to past or typical performance, rather than optimal program performance, then the estimate will be inherently conservative. The elements of program strategy and design that are embedded in the comparison may not be appropriate for a study that seeks to identify the full scope of achievable potential.²¹

When a conservation potential study underestimates the amount of cost effective savings that are available, either by failing to appropriately quantify certain measures, i.e., omitting opportunities outright, or by assuming non-optimized program designs that are calibrated to past performance, the record of a proceeding may be insufficient to support a well-informed decision. In the PSCo Strategic Issues proceeding, Energy Futures Group, the Southwest Energy Efficiency Partnership (SWEET), and the Colorado Energy Office each submitted evidence demonstrating that the energy efficiency potential study commissioned by PSCo significantly underestimated savings. In its final decision, the Colorado PUC rejected PSCo’s proposed reduced savings goals based on PSCo’s potential study, and declined to approve a non-unanimous settlement proposal of 400 GWh/year annual savings. Instead, the regulator ordered PSCo to meet savings targets for the next five-year period that are 20% higher than the Company’s most recent actual savings have been. The panel states:

The Commission is persuaded by the testimony offered by CEO, NRDC/Sierra, and SWEET, as well as the analysis of the Company’s DSM potential submitted

²¹Direct Testimony of Jim Grevatt On Behalf of Sierra Club and NRDC, Colorado PUC Proceeding No. 17A-0462EG, p. 23 (underline added).

by SWEEP that the energy savings goals for Public Service should be set at 500 GWh for each year for the period 2019 through 2023.²²

A detailed analysis of the BC CPR Market Potential Forecast for FEI is beyond the terms of my engagement. However, it is instructive to note that both the BC CPR and the PSCo potential study, also prepared by Navigant, calibrate estimates of savings potential to past performance to validate their results. The BC CPR Market Potential Forecast validation process is described as follows:

Navigant took a number of steps to ensure that forecast model results were reasonable, including:

- » Identifying the subset of CPR measures that were included in historic program offerings in order to have a basis for comparison with historic program achievements.
- » Ensuring similar trends and magnitudes between average historic sector-level savings between 2013-2015 and simulated sector-level savings from the measure subset in 2016.
- » For the five high-impact measures, ensuring similar trends and magnitudes between historic measure-level savings and 2016 simulated savings. Additionally, the team calibrated long-term trends to align reasonably with FortisBC Gas's projections for these measures.
- » Seeking general alignment between 2015 historic sector-level incentives as a percentage of total sector-level spending and simulated 2016 values.²³

Thus, the BC CPR may, like the Colorado potential study, underestimate the savings potential compared to savings potential estimates based on programs that are designed and implemented with the intent of capturing the maximum possible cost effective savings.

²² The Public Utilities Commission of the State of Colorado, Decision No. C18-0417, DECISION APPROVING, WITH MODIFICATIONS, NON-UNANIMOUS COMPREHENSIVE SETTLEMENT; AND ESTABLISHING ELECTRIC ENERGY SAVINGS AND DEMAND REDUCTION GOALS FOR 2019 THROUGH 2023, WITH ASSOCIATED FINANCIAL INCENTIVES, PURSUANT TO § 40-3.2-104, C.R.S., p. 21, <http://www.swenergy.org/Data/Sites/1/media/documents/news/co-xcel-dsm-puc-decision-6-6-18.pdf>.

²³ Exhibit B-1, FEI LTGRP pdf. p.502.

The observation that FEI is proposing to save less energy than is cost effectively available is supported by comparing its proposed savings with leading jurisdictions that are achieving much higher savings than are proposed in the Reference Case. FEI indicates that its 2018 savings as a percentage of 2016 sales²⁴ is estimated to be 0.52%,²⁵ and that its average annual Reference Case savings over the 20 year plan period, expressed as a percentage of sales, is 0.36%.²⁶ Reproduced below for convenience is Table 11 from ACEEE's State Energy Efficiency Scorecard, showing that for 2016 there were 14 U.S. states that achieved a greater percentage of natural gas savings than the 0.52% savings as a percent of sales that FEI expects to achieve in 2018. In fact, nine of these states achieved savings between 0.55% and 1.0% of sales, and five achieved greater than 1.0% savings, with Minnesota in the lead at 1.4% natural gas savings as a percent of sales.²⁷

²⁴ Note that 2018 sales are likely to be higher than 2016 sales, which would modestly decrease this percentage.

²⁵ Exhibit B-5, FEI response to BCUC IR 2.63.2, pdf p.65; Exhibit B-3, FEI response to BCSEA IR 1.19.5, pdf pp.48-49.

²⁶ Exhibit B-2, FEI response to BCUC IR 1.27.2, pdf p.118.

²⁷ In Exhibit B-6, FEI response to BCSEA IR 2.53.1, pdf p.35, FEI provides a comparison table prepared by E Source showing savings as a percent of sales for non-EERS states (i.e. states without legislated or regulated energy efficiency resource standards). However, some of the values in the table are not plausible. For example, the table notes that the ratio for Washington Gas Light in Virginia is calculated using lifetime rather than annual savings, yielding a comparison value of roughly 9%, which is not comparable with an annual savings estimate. The table's results are over 3% for Black Hills and Puget Sound and 6% for Questar: none of which is plausible. Rather than relying on the E Source table, it is preferable to review the results for gas utilities from ACEEE's 2017 Scorecard [see text, above] to illustrate that leading utilities are capturing more savings than FEI projects to achieve.

Table 11. State scores for 2016 natural gas efficiency program savings

| State | 2016 net incremental gas savings (MMTherms) | % of commercial and residential retail sales | Score (3 pts.) |
|----------------------|---|--|----------------|
| Minnesota† | 30.83 | 1.40% | 3 |
| Rhode Island | 4.18 | 1.26% | 3 |
| Massachusetts | 27.30 | 1.13% | 2.5 |
| Michigan | 52.39 | 1.05% | 2.5 |
| Oregon | 6.72 | 1.03% | 2.5 |
| New Hampshire† | 1.66 | 0.92% | 2 |
| Wisconsin | 19.20 | 0.85% | 2 |
| Utah | 8.27 | 0.85% | 2 |
| Iowa† | 9.80 | 0.84% | 2 |
| Hawaii‡ | - | - | 2 |
| Vermont | 0.76 | 0.75% | 1.5 |
| California | 48.80 | 0.74% | 1.5 |
| Connecticut | 7.10 | 0.66% | 1.5 |
| Arkansas | 5.04 | 0.60% | 1.5 |
| Arizona | 3.68 | 0.55% | 1 |
| Kentucky | 4.30 | 0.49% | 1 |
| Maine† | 0.62 | 0.47% | 1 |
| Indiana | 10.07 | 0.46% | 1 |
| Washington | 5.77 | 0.46% | 1 |
| Illinois | 27.57 | 0.43% | 1 |
| New York | 30.92 | 0.39% | 0.5 |
| Colorado | 6.96 | 0.38% | 0.5 |
| District of Columbia | 1.04 | 0.33% | 0.5 |
| Oklahoma | 3.11 | 0.30% | 0.5 |
| South Dakota | 0.61 | 0.27% | 0.5 |
| New Jersey† | 10.74 | 0.26% | 0.5 |
| Montana | 0.96 | 0.24% | 0.5 |
| Mississippi | 0.79 | 0.18% | 0 |
| Ohio* | 7.11 | 0.15% | 0 |
| New Mexico* | 0.75 | 0.12% | 0 |
| Maryland | 1.65 | 0.10% | 0 |
| North Carolina | 1.13 | 0.09% | 0 |
| Idaho | 0.19 | 0.05% | 0 |
| North Dakota | 0.10 | 0.04% | 0 |
| Nevada† | 0.23 | 0.03% | 0 |
| Pennsylvania | 0.78 | 0.02% | 0 |
| Delaware† | 0.00 | 0.00% | 0 |
| Alabama | 0.00 | 0.00% | 0 |
| Alaska | 0.00 | 0.00% | 0 |
| Florida | 0.00 | 0.00% | 0 |
| Georgia | 0.00 | 0.00% | 0 |
| Guam | 0.00 | 0.00% | 0 |
| Kansas | 0.00 | 0.00% | 0 |
| Louisiana | 0.00 | 0.00% | 0 |
| Missouri | 0.00 | 0.00% | 0 |
| Nebraska | 0.00 | 0.00% | 0 |
| Puerto Rico | 0.00 | 0.00% | 0 |
| South Carolina | 0.00 | 0.00% | 0 |
| Tennessee | 0.00 | 0.00% | 0 |
| Texas | 0.00 | 0.00% | 0 |
| Virgin Islands | 0.00 | 0.00% | 0 |
| Virginia | 0.00 | 0.00% | 0 |
| West Virginia | 0.00 | 0.00% | 0 |
| Wyoming | 0.00 | 0.00% | 0 |
| US total | 340.89 | 0.42% | |
| Median | 0.96 | 0.24% | |

Savings data were reported by contacts at public utility commissions as listed in Appendix A, unless otherwise noted. All sales data are from EIA Form 176 (2017a). States that did not report natural gas savings for 2015 or 2016, and for which data were not available elsewhere, were treated as having no savings. * These states did not report 2016 savings and were scored on 2015 savings as reported by public utility commission contacts. † At least a portion of savings reported as gross. We adjusted the gross portion by a net-to-gross factor of 0.873 to make it more comparable to net savings figures reported by other states. ‡ Hawaii and the US territories use limited natural gas and therefore earn points commensurate with electric efficiency savings scores.

In providing this ACEEE comparison, I do not intend to suggest that all things are equal in these different jurisdictions, or that FEI can necessarily achieve the 1.4% savings on average during the 20 year planning period that Minnesota did in 2016. Rather, my point is to demonstrate that there is good reason to believe that FEI could cost-effectively achieve much greater savings than the average 0.36% annual savings it suggests for market potential in the Reference Case.

The BCUC will only have sufficient information to establish long-term savings projections on which to base C&EM targets and budgets if it is provided with a full understanding of the amount of cost effective savings that FEI could obtain. While the DSM Expenditure Schedule, rather than the LTGRP, is the forum for establishing specific C&EM savings targets and budgets, it is critical that the LTGRP provide a fully fleshed out understanding of the amount of cost effective savings that could be procured through programs that are designed and implemented to produce all cost-effective savings.

III. Conclusion

EFG concludes that:

1. FEI's open-ended proposal to study the potential use of DSM to defer traditional peak capacity-related infrastructure investments is insufficient to ensure that the BCUC won't be "forced" to approve capital investments that could have been avoided. FEI should submit to the BCUC a proposal and timeline for conducting the analyses that will allow it to fairly consider DSM alternatives to infrastructure investments in the early stages of any project development.
2. The Reference Case savings in the LTGRP are based in the BC CPR's Market Potential Forecast, which is very likely to significantly underestimate the savings that FEI could be expected to achieve through programs that are designed to maximize savings. Analysis in the CPR of the "Maximum Achievable" savings potential would provide useful information for the BCUC to consider in its determinations regarding the DSM Expenditure Schedules that FEI has filed and will file in the coming years. Absent a fully fleshed out picture of the available savings it is unlikely that FEI will propose savings targets that will maximize the benefits to ratepayers.

Appendices

Appendix A: James Grevatt, Curriculum Vitae

Appendix B: Direct Testimony of James Grevatt On Behalf of Sierra Club and NRDC,
Colorado PUC Proceeding No. 17A-0462EG.

Appendix A: James Grevatt, Curriculum Vitae



JIM GREVATT, MANAGING CONSULTANT

EDUCATION

B.F.A., University Honors, University of Illinois, 1982

EXPERIENCE

2013-present: Managing Consultant, Energy Futures Group, Hinesburg, VT
2012-2013: Director, Targeted Implementation, Vermont Energy Investment Corp., Burlington, VT
2011-2012: Director, Residential Energy Services, District of Columbia Sustainable Energy Utility for Vermont Energy Investment Corp., Washington, D.C. and Burlington, VT
2010-2012: Managing Consultant, Vermont Energy Investment Corporation, Burlington, VT
2005-2010: Director, Residential Services, Vermont Energy Investment Corp., Burlington, VT
2001-2005: Manager, Energy Services, Vermont Gas Systems, S. Burlington, VT
1998-2001: Manager, Residential Energy Services, Vermont Gas Systems, S. Burlington, VT
1996-1998: Manager, HomeBase Retrofit Program, Vermont Gas Systems, S. Burlington, VT
1994-1996: Technical Specialist, Vermont Gas Systems, S. Burlington, VT
1991-1994: Technical Specialist, Champlain Valley Weatherization Program, Burlington, VT

PROFESSIONAL SUMMARY

Jim Grevatt brings over 20 years' experience as a leadership professional in energy efficiency program operations to his consulting practice. Jim focuses on both the forest and the trees, using an in-depth knowledge of the nuts and bolts of running programs and a clear understanding of strategic thinking and planning to ensure that programs achieve their desired market impacts. Throughout his career, Jim has focused on building strong relationships with staff, peers, trade allies, and clients as the best way to understand the needs and challenges that each sector faces.

SELECTED PROJECTS

- **Targeted Implementation, VEIC-** Responsible for market analysis and strategic planning for a new division expanding VEIC's energy efficiency program implementation projects (2012-2013)
- **DC Sustainable Energy Utility-** Led the planning and startup implementation of Residential programs for the DC SEU, including single and multi-family and retail market programs. Led the development of the initial portfolio-level Annual Plan. Led client and partner interactions around planning and policy development. Member of DC SEU Senior Management Team (2011-2012)
- **EmPOWER Maryland Critical Program Review-** Expert consultant to the Maryland Office of Peoples' Counsel in EmPOWER Maryland hearings regarding utility energy efficiency planning and reporting. Represented the OPC in stakeholder meetings that informed the current 2012-2014 EmPOWER plans. Multiple appearances before the Maryland Public Service Commission. (2010-2012)
- **Efficiency Vermont 20 year Forecast of Efficiency Potential-** Senior Advisor in developing the forecast scenarios that led to significantly increased efficiency investment in Vermont (2010-2011)



JIM GREVATT, MANAGING CONSULTANT

- **Efficiency Vermont Residential Programs-** Directed 100% growth in program budgets to nearly \$10M annually. Responsible for strategic direction, leadership, and results for Efficiency Vermont's award-winning residential retrofit, new construction, retail, and low income programs. Supported excellence in a staff of 30 (2005-2010).
- **Vermont Gas Systems Efficiency Program Leader-** Directed strategic planning and program operations that led to six programs and portfolio as a whole being recognized as exemplary in *Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs* (ACEEE, 2003). Built contractor infrastructure and internal support to consistently meet program objectives. Led development of Annual Reports, planning and budgeting. Collaborated with Efficiency Vermont staff to develop a fuel-blind, state-wide, jointly offered residential new construction program (2001-2005)
- **Residential Retrofit Program Development-** Enhanced design and performance of VGS' residential retrofit offerings by streamlining delivery and building strong relationships with contractors, homeowners, and property managers (1994-2005)
- **Demonstrated Technical Excellence in Approaches to Residential Retrofits** Conducted hundreds of residential energy audits and quality assurance inspections for natural gas and alternative-fueled homes. Trained and coached installers to obtain desired quality. Worked to satisfy homeowners through explanation, education, sound listening to concerns, and ultimately assuring that concerns were addressed. Trained new staff in auditing techniques. (1991-1998)

SELECTED PUBLICATIONS AND PRESENTATIONS

Residential Retrofit Programs: What's Working? Perspectives from National Program Leaders- Panelist at AESP National Conference 2012

Elements of Retrofit Program Incentive Design- DOE Technical Assistance Program Publication, April, 2011

Designing Effective Incentives to Drive Residential Retrofit Participation- DOE Technical Assistance Program Webinar, October, 2010

Quality Assurance for Residential Retrofit Programs- DOE Technical Assistance Program Webinar, October, 2010

Home Performance with ENERGY STAR, Quality Assurance in Vermont- Panelist at the ACI Home Energy Retrofit Summit, April 2010

Delivering on the Promise-Engaging Communities and the Public- Panelist at 2010 NEEP Summit, March, 2010

Home Performance with Energy Star in Vermont - Presentation at CEE Member meeting, June 2009

Leading by Example: Exemplary Low Income Energy Efficiency Programs - Presented on Efficiency Vermont's Residential low income services at California's Low Income Energy Efficiency Symposium, June 2006

"Natural Gas Efficiency Policies, Responding to the Natural Gas Crisis One Therm at a Time" - Co-presented with Dan York and Anna Monis Shipley of American Council for an Energy-Efficient Economy (ACEEE) -ACEEE/CEE Market Transformation Symposium, 2004

Appendix B: Direct Testimony of James Grevatt On Behalf of Sierra Club and NRDC, Colorado PUC Proceeding No. 17A-0462EG.

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO**

**IN THE MATTER OF THE
APPLICATION OF PUBLIC SERVICE
COMPANY OF COLORADO FOR
APPROVAL OF A NUMBER OF
STRATEGIC ISSUES RELATING TO ITS
ELECTRIC AND GAS DEMAND SIDE
MANAGEMENT PLAN**

PROCEEDING NO. 17A-0462EG

Direct Testimony of

Jim Grevatt

Energy Futures Group

On Behalf of Natural Resources Defense Council and Sierra Club

December 5, 2017

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List of Attachments

Attachment JG-1

Jim Grevatt Resume

Attachment JG-2

“Ten Pitfalls of Potential Studies” by Chris
Kramer and Glenn Reed

Attachment JG-3

Discover Requests of the Office of Consumer
Counsel and of Sierra Club and NRDC

1 **I. INTRODUCTION AND QUALIFICATIONS.**

2 **Q. Please state your name, title and employer.**

3 A. My name is Jim Grevatt. I am a Managing Consultant at Energy Futures Group, located
4 at 10298 Route 116, Hinesburg, VT 05461.

5 **Q. Please describe Energy Futures Group.**

6 A. Energy Futures Group (EFG) is an energy efficiency consulting firm established in 2010.
7 EFG specializes in the design, implementation, and evaluation of energy efficiency
8 programs and policies, with a particular emphasis on cutting edge strategies to cost-
9 effectively achieve deep levels of savings and broad program participation. EFG has
10 worked on behalf of utilities and other energy efficiency program administrators,
11 government and regulatory agencies, and environmental, low income, and affordable
12 housing advocacy organizations in more than 20 states and Canadian provinces, as well
13 as several countries in Europe. EFG’s recent work has included serving as advisors on the
14 development of efficiency program portfolios and policies in four of the six highest-
15 ranking states in the American Council for an Energy-Efficient Economy’s (ACEEE)
16 2016 State Energy Efficiency Scorecard.¹ In addition, EFG played key roles in
17 developing a report on lessons learned from leading residential retrofit programs in North
18 America and Europe; an analysis on the key pitfalls that can be encountered in
19 performing energy efficiency potential studies; a study of emerging practices in the use of

¹ Weston Berg, et al., “The 2016 State Energy Efficiency Scorecard,” American Council for an Energy Efficient Economy, report U1606, (Sept. 2016), available at <http://aceee.org/sites/default/files/publications/researchreports/u1606.pdf>.

1 energy efficiency to defer or entirely avoid electric transmission and distribution
2 upgrades; the development of a regional residential lighting strategy for the Northeast;
3 and an assessment of the effectiveness of leading efficiency financing initiatives.

4 **Q. Please summarize your professional and educational experience.**

5 A. I have worked in the energy efficiency industry since 1991 in a wide variety of roles.
6 Prior to joining EFG, I served as the Director of Residential Energy Services at
7 Efficiency Vermont and the District of Columbia Sustainable Energy Utility. I also
8 served as the Manager of Energy Services at Vermont Gas Systems, managing both
9 residential and commercial utility energy efficiency programs. I have extensive hands-on
10 experience conducting hundreds of energy audits for Vermont's Low-Income
11 Weatherization Assistance Program and Vermont Gas Systems' DSM programs.

12 In my current role as Managing Consultant at EFG, I have advised regulators including
13 public utility commissions, utilities and other energy efficiency program administrators,
14 and environmental, low income, and affordable housing advocates in numerous states,
15 including Missouri, Mississippi, Maryland, Pennsylvania, Delaware, Virginia, New
16 Jersey, Illinois, California, Vermont, Maine, Nevada, and New Hampshire, as well as
17 British Columbia.

18 I received a B.F.A. from the University of Illinois.

19 My resume, attached as Attachment JG-1, presents a summary of my professional and
20 educational experience.

1 **Q. Please describe your professional experience as it relates to energy efficiency policies**
2 **and programs.**

3 A. I have worked in the energy efficiency industry since 1991 in a wide variety of roles,
4 including extensive hands-on experience conducting hundreds of energy audits for
5 Vermont's low-income Weatherization Assistance Program and Vermont Gas Systems'
6 Demand-Side Management programs. I was the Energy Services Manager at Vermont
7 Gas, managing both residential and commercial energy efficiency programs, and the
8 Director of Residential Energy Services at Efficiency Vermont and the District of
9 Columbia Sustainable Energy Utility. At Energy Futures Group, I have advised
10 regulators, program implementers, and advocates in Missouri, Mississippi, Maryland,
11 Kentucky, Pennsylvania, Delaware, Virginia, New Jersey, Illinois, California, Vermont,
12 Maine, Nevada, New Hampshire, and British Columbia. I focus on using my in-depth
13 knowledge of energy efficiency program operations and management and experience in
14 strategic planning to ensure that programs achieve their desired market impacts.

15 **Q. On whose behalf are you testifying in this case?**

16 A. I am testifying on behalf of Natural Resources Defense Council ("NRDC") and Sierra
17 Club.

18 **Q. What is the purpose of your testimony?**

19 A. The purpose of my testimony is to provide information for the Commission's
20 consideration as it addresses the issues raised by Public Service Company of Colorado
21 "the Company" or "Public Service") in the "Verified Application of Public Service
22 Company of Colorado for Approval of Strategic Issue Proposals Relating to its Next

1 Electric and Gas Demand Side Management Plan.” Specifically, I address the magnitude
2 of the electric energy savings goals proposed by Public Service in its Application, and
3 show that the Company’s proposed savings targets are far too low in light of Governor
4 Hickenlooper’s Executive Order requiring 2% annual electric savings in the State. I show
5 that this is the case due to the effects of conservatism in the 2016 Navigant potential
6 study and the Company’s own consistent underestimation of its ability to deliver savings
7 at lower costs than budgeted.

8 **Q. Have you previously testified before the Public Utilities Commission of the State of**
9 **Colorado?**

10 A. No.

11 **II. SUMMARY OF CONCLUSIONS AND RECOMMENDATION.**

12 **Q. Please summarize your primary conclusions.**

13 A. My primary conclusions are summarized as follows:

- 14 1. Governor Hickenlooper’s Executive Order calling for 2% annual electric savings should
15 prod the Company to maximize its achievement of cost-effective savings, but the
16 Company’s conservatism in its savings proposals is contradictory to the Executive Order.
- 17 2. Navigant significantly under-estimates achievable savings in its potential study.
- 18 3. The Company has consistently proposed budgets that are greater than it needs to achieve
19 its savings targets and could have saved significantly more energy for its customers by
20 fully utilizing its approved budgets.

1 4. Geo-targeting has the potential to be beneficial for ratepayers in deferring infrastructure
2 investments, but it should be considered as additional to, rather than instead of, broad-
3 based DSM programs that provide system-wide benefits.

4 **Q. What are your recommendations to the Commission in this proceeding?**

5 A. First, I recommend that the Commission establish annual savings requirements for the
6 Company as follows: 550 GWh in 2019; 575 GWh in 2020; 500 GWh in each of 2021-
7 2023.

8 Second, I recommend that the Commission ensure that in pursuing these increased
9 savings, the Company continues to provide ample opportunities for all customer
10 segments. Under-served markets that the Company should provide more opportunities for
11 include the Company’s most vulnerable customers, such as those residing in low income
12 multifamily housing.

13 Third, I recommend that the Commission approve the Company’s request to use geo-
14 targeted energy efficiency where it can cost-effectively defer T&D investments, with the
15 caveat that the Company should use geo-targeting in addition to broad-based DSM
16 programs, rather than in place of them.

17 **III. CONTEXT FOR ASSESSING THE COMPANY’S SAVINGS TARGET PROPOSAL**

18 **Q. What regulations or statutes determine the level of savings that the Company must**
19 **achieve?**

20 A. House Bill 07-1037 established the minimum annual savings for the Company in 2007:
21 “The energy savings and peak demand reduction goals shall be at least five percent of

1 the utility’s retail system peak demand measured in megawatts in the base year and at
2 least five percent of the utility’s retail energy sales measured in megawatt-hours in the
3 base year. The base year shall be 2006.”² The minimum annual savings requirement was
4 renewed with the passage of House Bill 17-1227, which “extends the programs to 2028
5 and requires the commission to set goals of at least 5% peak demand reduction and 5%
6 energy savings by 2028 for demand-side management programs implemented during
7 2019 through 2028 when compared to 2018 numbers.”³

8 **Q. Are there other regulations or laws that suggest Public Service should be required**
9 **to achieve a greater level of savings than the minimum referenced above?**

10 A. Yes. The Executive Order issued by Governor Hickenlooper “declare[s] that it shall be
11 the goal of the State of Colorado to...achieve electricity savings of 2% of total electricity
12 sales per year by 2020 through cost-effective energy efficiency.”⁴ The Order further
13 states that “This Executive Order shall remain in effect until modified or rescinded by
14 future Executive Order of the Governor.”⁵

15 The Executive Order also calls for “A 35% reduction in carbon dioxide emissions from
16 the electricity sector by 2030, as compared with 2012 levels.”⁶ Energy efficiency
17 provides a cost-effective means of significantly reducing carbon emissions from this

² Col. Rev. Stat. § 40-3.2-104(2)

³ <https://leg.colorado.gov/bills/hb17-1227>, summary on Colorado General Assembly website.

⁴ Executive Order D2017-015 of Governor John W. Hickenlooper, July 11, 2017, Section II.A.4, p. 2.

⁵ Id., p. 3.

⁶ Id., p. 2.

1 sector, while simultaneously providing bill savings for participants, and myriad other
2 benefits.⁷

3 The State will need to act quickly to take advantage of the most effective means at its
4 disposal to achieve the mandates of the Executive Order. In my view, there is no question
5 that focusing the Company's programs on achieving all cost-effective energy efficiency
6 should be a critical component of the State's approach to achieving these goals.

7 In addition, the Company is currently implementing programs to comply with the
8 Colorado Public Utilities Commission ("CPUC") Decision C14-0731,⁸ which requires it
9 to achieve 400 GWh per year of annual electric savings through 2020.

10 **Q. With regard to its savings goals for its next Electric and Gas Demand Side**
11 **Management Plan, what has the Company proposed?**

12 A. The Company has proposed that its annual electric energy efficiency goals be reduced
13 from current approved levels to lower levels, beginning with the 2019 program year. The
14 Company proposes that its annual savings goals be reduced from 400 GWh to 350 GWh
15 in 2019 and 2020, and then further reduced to 325 GWh for 2021-2023, as shown in
16 Figure 1 below:

⁷ In addition to bill savings, energy efficiency can increase home comfort, address potential or existing health and safety issues, increase business productivity, and reduce electric system infrastructure and operations costs. See, e.g., Christopher Russel et al., "Recognizing the Value of Energy Efficiency's Multiple Benefits," American Council for an Energy-Efficient Economy, Dec. 2015, available at <http://aceee.org/research-report/ie1502>.

⁸ "In the Matter of the Application of Public Service Company of Colorado for Approval of a Number of Strategic Issues Relating to Its Demand Side Management Plan," Docket No. 13A-0686 EG, Decision No. C14-0731 (adopted May 28, 2014).

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|-------|-------|-------|-------|-------|
| GWh/Year | 350 | 350 | 325 | 325 | 325 |
| Savings as a % of sales | 1.15% | 1.15% | 1.05% | 1.04% | 1.02% |

Figure 1: PSCO Proposed Annual Electric Energy Savings Goals⁹

Q. How do the current and proposed savings levels compare with the Company’s historic savings achievements?

A. The Company’s recent savings achievements are shown below in Figure 2. Annual net GWh savings are shown, along with the percentage of retail sales represented by the savings.

| | 2014 | 2015 | 2016 |
|-------------------------|-------|-------|-------|
| Annual GWh Savings | 392 | 406 | 410 |
| Savings as a % of Sales | 1.29% | 1.34% | 1.35% |

Figure 2: Public Service’ Recent Savings Achievements¹⁰

⁹ Savings from Verified Application of Public Service Company of Colorado for Approval of Strategic Issue Proposals Relating to its Next Electric and Gas Demand Side Management Plan, July 3, 2017, p. 7-8. Forecast net sales at the generator from Response of Public Service Company of Colorado to First Discovery Request of the Office of Consumer Counsel, Item number OCC 1-28. Attachment JG-3, p. 1 of 11.

¹⁰ 2014 Net Savings at the generator are from 2014 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Docket No. 13A-0773EG, April 1, 2015. 2015 Net Savings at the generator are from 2015 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Proceeding No. 14A-1057EG, March 30, 2016. 2016 Net Savings at the generator are from 2016 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Proceeding No. 14A-1057EG, March 31, 2017. Sales for 2014-2016 are retail sales at the meter from the Energy Information Agency at <https://www.eia.gov/electricity/data/eia861m/index.html>, grossed up to generator level sales using the average difference between meter sales forecasts and generator sales forecasts in the Response of Public Service Company of Colorado to First Discovery Request of the Office of Consumer Counsel, Item number OCC 1-28, Attachment JG-3, p. 1 of 11.

1 **Q. Is the Company's proposal to reduce its savings targets below the currently**
2 **approved levels consistent with Governor Hickenlooper's Executive Order**
3 **Supporting Colorado's Clean Energy Transition?**

4 A. No. Decreasing the energy savings targets for Public Service is contrary to the Executive
5 Order, especially in light of my conclusion that there are significantly more savings that
6 are cost-effectively available than the Company has identified.

7 **Q. Is it your view that utility company energy efficiency programs alone are**
8 **responsible for meeting the requirements of the Executive Order?**

9 A. The Executive Order does not explicitly state that utility company energy efficiency
10 programs are required to achieve 2% savings. However, common sense suggests that,
11 given the rapid timeline necessary to achieve 2% savings starting in 2020, the State must
12 take advantage of the best opportunities that are available to it.¹¹ Utility energy efficiency
13 programs in general, and the Company's programs specifically, are well-positioned to
14 achieve most, if not all of the required savings, as they are already firmly established
15 within a framework that addresses cost-effectiveness and cost-recovery, such that rapid
16 ramp-up of program savings can be attained.

¹¹ Note that the Company's savings as referenced in my testimony are net at the generator. It is not explicitly stated in the Executive Order, but reasonable to assume that gross savings at the generator would be the appropriate metric to use in determining compliance with the Executive Order.

1 **Q. Public Service is proposing savings goals that do not support attainment of the**
2 **requirements of the Executive Order. In your judgment, is the Company’s position**
3 **regarding its proposed goal reduction supported by the evidence?**

4 A. No. While the Company appropriately raises issues that may reduce the availability of
5 cost-effective energy efficiency savings in the latter years of the planning period, it is
6 nevertheless far too conservative in estimating the savings that it will be able to capture
7 through its programs. I will demonstrate in my testimony that Public Service can
8 reasonably and cost-effectively achieve evaluated net savings that are significantly higher
9 than what the Company proposes. I agree with the Company that the availability of cost-
10 effective savings will decline after 2020, but not by the extreme amounts that the
11 Company suggests. I recommend that the Commission establish savings requirements for
12 Public Service as shown in Figure 3:

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------------|-------|-------|-------|-------|-------|
| GWh/Year | 550 | 575 | 500 | 500 | 500 |
| Savings as a % of sales | 1.81% | 1.88% | 1.61% | 1.60% | 1.57% |

13
14 **Figure 3: NRDC and Sierra Club Recommendation for Public Service Savings Targets¹²**

15 My testimony demonstrates that it will be possible for the Company to meet these targets.
16 First, I provide comparative information on forward-looking energy efficiency program
17 savings targets in Rhode Island, Maryland, and Illinois that are much higher than what
18 Public Service proposes. I then address limitations in the 2016 Navigant potential study
19 that was prepared for the Company and show why I believe that it is an inherently

¹² Forecast net sales at the generator from Response of Public Service Company of Colorado to First Discovery Request of the Office of Consumer Counsel, Item number OCC 1-28. Attachment JG-3, p. 1 of 11.

1 conservative estimate of achievable potential. I also illustrate how the Company has
2 consistently under-estimated its own ability to achieve savings, while over-estimating the
3 required costs. This trend is so consistent that it indicates a systemic conservatism in how
4 the Company determines its proposed costs and savings. Lastly, I provide a revised
5 estimate of achievable energy savings potential that addresses the deficiencies listed
6 above, showing how Public Service can achieve savings that are consistent with
7 Governor Hickenlooper's Executive Order.

8 **IV. COMPARISON OF PUBLIC SERVICE WITH LEADING PORTFOLIOS**

9 **Q. Is it possible to compare the Company's savings achievements with those of leading**
10 **jurisdictions in North America?**

11 A. Yes. The American Council for an Energy Efficient Economy (ACEEE) is widely
12 recognized for its annual ranking of state energy efficiency program performance. In its
13 assessment, it includes analysis of the annual savings achieved in different states as a
14 percentage of retail electric sales. ACEEE's most recent report, *The 2017 State Energy*
15 *Efficiency Scorecard*, was released in September, 2017.¹³ The net savings as a percent of
16 retail sales for Colorado, 0.89%, are shown below in Figure 4. Also shown are the
17 seventeen states that saved more than Colorado as a percent of retail sales, led by
18 Vermont at 2.52%, Rhode Island at 2.85% and Massachusetts at 3.00%. Colorado's
19 savings are less than one-third of the savings achieved in Massachusetts and Rhode
20 Island, and only slightly more than one-third of the savings achieved in Vermont:

¹³ Weston Berg, et al., "The 2017 State Energy Efficiency Scorecard," American Council for an Energy Efficient Economy, report U1710, September, 2017, available at <http://aceee.org/sites/default/files/publications/researchreports/u1710.pdf>.

| State | 2016 net incremental savings (MWh) | % of 2016 retail sales | Score (6 pts.) |
|---------------|------------------------------------|------------------------|----------------|
| Massachusetts | 1,569,661 | 3.00% | 7 |
| Rhode Island | 214,329 | 2.85% | 7 |
| Vermont | 138,318 | 2.52% | 7 |
| Washington† | 1,358,095 | 1.54% | 5 |
| California† | 3,909,215 | 1.54% | 5 |
| Connecticut | 442,250 | 1.53% | 5 |
| Arizona | 1,108,273 | 1.42% | 4.5 |
| Maine† | 157,921 | 1.38% | 4.5 |
| Hawaii*† | 124,399 | 1.32% | 4.5 |
| Minnesota† | 847,830 | 1.31% | 4.5 |
| Illinois | 1,716,876 | 1.23% | 4 |
| Michigan | 1,209,981 | 1.17% | 4 |
| Oregon† | 537,331 | 1.16% | 4 |
| Idaho† | 258,598 | 1.13% | 3.5 |
| New York | 1,599,900 | 1.09% | 3.5 |
| Iowa†† | 482,316 | 1.01% | 3 |
| Maryland | 560,617 | 0.91% | 3 |
| Colorado | 487,396 | 0.89% | 3 |

1

2

Figure 4: Excerpt of Table 9. 2016 net incremental electricity savings by state¹⁴

3

Q. Are the Company's historic savings consistent with those of the State as a whole?

4

A. Public Service has achieved greater savings as a percent of sales than the state as a whole, as evidenced by ACEEE in its *2017 Utility Energy Efficiency Scorecard*, seen below in

5

6

Figure 5:

¹⁴ Id., p. 29.

| Utility | Net incremental savings (MWh) | Savings as % of sales | Points |
|------------------|-------------------------------|-----------------------|--------|
| Eversource MA | 789,186 | 3.19% | 8 |
| NG MA | 679,852 | 3.07% | 8 |
| Eversource CT | 357,699 | 1.51% | 4 |
| APS ^b | 451,330 | 1.51% | 4 |
| PG&E | 1,378,895 | 1.48% | 4 |
| SRP ^b | 430,152 | 1.47% | 4 |
| Xcel CO | 429,891 | 1.41% | 4 |

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Figure 5: Excerpt of Table 6: Scores for net savings as a percentage of retail sales in 2015¹⁵

While the Company ranks considerably higher in the Utility Scorecard than the State as a whole does in the State Scorecard, it is important to note, without diminishing the Company’s historic achievements, that the Utility Scorecard only included data from the “United States’ 51 largest electric utilities by retail sales volume,” therefore program administrators that achieved much higher savings than Public Service, such as National Grid in Rhode Island, Efficiency Vermont, and utilities in the state of Washington were not included in this analysis. This is important, because looking only at the Utility Scorecard without considering the high performing program administrators that were not included in it could give the false impression that the Company is one among only a handful of peers.

¹⁵ Grace Relf, et al., “The 2017 Utility Energy Efficiency Scorecard,” The American Council for an Energy-Efficient Economy, report U1707, June 2017, available at <http://aceee.org/sites/default/files/publications/researchreports/u1707.pdf>. Note that ACEEE shows the Company having achieved a higher percentage of sales than I did in Figure 2, presumably because they used EIA reported customer sales at the meter, rather than at the generator.

1 **Q. Has the Company explained why it is proposing a level of savings that is less than**
2 **the currently approved targets?**

3 A. Yes, in its Application the Company states that “The opportunity for energy savings is
4 declining due to several factors, such as changes to lighting baselines and increasingly
5 stringent building standards that will reduce the future energy savings potential for the
6 Company’s DSM.”¹⁶ The Company also states that “Without a viable long-term solution
7 to address DSM lost fixed cost recovery, the Company will be forced to reevaluate its
8 commitment to achieving DSM reductions beyond the statutory minimum,”¹⁷ though I
9 caution that it is important not to conflate cost-recovery issues with any perceived
10 limitations on the availability of cost-effective energy efficiency savings. My testimony is
11 focused on showing that the availability of energy savings supports higher targets than
12 the Company has proposed.

13 **Q. The savings achievements that you reference above are historic, rather than**
14 **forward- looking proposals. Are the issues that the Company identifies as leading it**
15 **to propose reduced savings targets also affecting proposed program savings in other**
16 **jurisdictions?**

17 A. Certainly. The changes in the retail lighting market, and the effect of increasing codes
18 and standards that the Company identifies have been raised in goal setting proceedings in
19 other regions and jurisdictions. There are also other jurisdictions that have had long-
20 standing utility energy efficiency programs that, by capturing savings on a sustained

¹⁶ Application at p. 2. The Company elaborates on the issues it identifies in the testimony of Company Witnesses Beaman and White.

¹⁷ Id., p. 3

1 basis, have potentially reduced the future achievable potential. However, this does not
2 mean that other jurisdictions are necessarily adopting reduced goals. For example,
3 National Grid recently released its 2018-2020 Energy Efficiency and System Reliability
4 Procurement Plan for Rhode Island.¹⁸ In this Plan, the utility proposes net electric
5 efficiency savings that will yield more than double the savings as a percent of sales that
6 the savings proposed by the Company in this proceeding will achieve. National Grid's
7 proposed savings are illustrated in Figure 6 below:

| | 2018 | 2019 | 2020 |
|------------------------------------|---------|---------|---------|
| Annual MWh Savings | 179,968 | 194,677 | 189,509 |
| Savings as a Percent of 2015 Sales | 2.40% | 2.60% | 2.53% |
| Benefit Cost Ratio (RI Test) | 2.93 | 2.88 | 3.23 |

8
9 **Figure 6: National Grid 2018-2020 Proposed Electric Savings¹⁹**

10 It is critical to note that the savings proposed by National Grid for Rhode Island reflect
11 “an assessment of evolving potential, which highlights the potential impact of codes and
12 standards, new technologies, and program enhancements that may occur over the next
13 few years.”²⁰ National Grid has been implementing aggressive energy efficiency
14 programs for its customers for a sustained period of time, has captured most or all of
15 what was once thought to be the low-hanging fruit, is addressing the very issues that
16 Public Service cites as justification for lower savings targets, and yet is still proposing net
17 savings targets of 2.4% and higher for the coming years.

¹⁸ National Grid 2018-2020 Energy Efficiency and System Reliability Procurement Plan, RIPUC Docket No. 4684, August 30, 2017.

¹⁹ Id., p. 6.

²⁰ Id., p. 12.

1 **Q. Are there other jurisdictions in addition to Rhode Island that are proposing to**
2 **continue to achieve very high levels of savings in spite of the changing conditions**
3 **that Public Service describes?**

4 A. Yes. I provide two additional examples of utilities that propose to achieve high levels of
5 portfolio savings despite adoption of increasingly stringent codes and standards and
6 energy efficiency market changes. The first is Maryland, where utilities recently filed
7 their 2018-2020 EmPOWER Program Plans. The EmPOWER statute requires these
8 utilities to achieve a minimum of 2.0% gross savings per year through 2023, in two three-
9 year program cycles. To comply with the statute, BGE proposed the gross savings shown
10 in Figure 7 as a percent of its 2016 retail sales for the upcoming three-year period:

| | 2018 | 2019 | 2020 |
|---|-------|-------|-------|
| Projected Energy Savings as % of 2016 BGE Sales Baseline | 2.09% | 2.15% | 2.26% |

11
12 **Figure 7: BGE Projected savings as a percentage of 2016 retail sales²¹**

13 In developing its proposed savings levels, “BGE looked at what had been accomplished
14 and what had been learned about the market over the past three program cycles,
15 additional impacts BGE felt were possible with cost effective programs, the effect the
16 economy would have, and the influence of changes in the marketplace as well as federal
17 and ENERGY STAR® standards. Furthermore, BGE recognized that a considerable
18 amount of the “low hanging fruit” had already been realized (especially in the C&I

²¹ Baltimore Gas and Electric Company (BGE) 2018-2020 EmPOWER program filing, Table 1-3, p. 15, available at <http://www.psc.state.md.us/Maillog/#216722>.

1 programs); and thus deeper savings projects will need to be found....”²² With this
2 statement, BGE acknowledges the impact that sustained energy efficiency programs,
3 transforming markets, and codes and standards updates have on the availability of cost-
4 effective energy efficiency program savings, yet nevertheless proposes savings levels on
5 the order of twice what Public Service suggests it can achieve.

6 Commonwealth Edison (“ComEd”) in Illinois also recently filed program plans for its
7 next program cycle. ComEd is expecting to achieve the level of annual MWh savings
8 shown below in Figure 8. It is important to note that large customers (over 10 MW) are
9 exempt from the ComEd programs, and therefore are not available as a source of savings.
10 Because of this, their sales are also subtracted from the baseline used to calculate savings
11 as a percent of sales.

| | 2018 | 2019 | 2020 | 2021 |
|-------------------------|-----------|-----------|-----------|-----------|
| Annual MWh Savings | 1,619,028 | 1,527,491 | 1,535,391 | 1,548,877 |
| Savings as a % of Sales | 2.06% | 1.94% | 1.95% | 1.97% |

12
13 **Figure 8: ComEd Annual MWh savings targets**²³

²² Id., p. 14.

²³ Savings from Docket 17-0312: Approval of the EE Plan. See file ComEd_DSMore_Batch_Files_Plan_5_7-26-17.xls, available at <http://www.ilsag.info/energy-efficiency-dockets.html>. Baseline sales from Direct Testimony of Michael S. Brandt in Docket 17-0312, Commonwealth Edison Company Approval of the Energy Efficiency and Demand-Response Plan and Update to the Energy Efficiency Formula Rate Cost Inputs Pursuant to Section 8-103B of the Public Utilities Act, lines 365-367, available at <https://www.icc.illinois.gov/docket/Documents.aspx?no=17-0312>.

1 **Q. Why is the exclusion of ComEd’s large industrial customers from the energy**
2 **efficiency programs and sales baseline relevant in this proceeding?**

3 A. Savings targets and achievements are often characterized as savings as a percentage of
4 retail sales, as they are in the ACEEE Scorecard and in Governor Hickenlooper’s
5 Executive Order. When this is the case, fewer sales mean the target is smaller in absolute
6 terms. In his testimony, Company Witness White states that “While the number of
7 [industrial] accounts is only somewhat higher in Minnesota, the size of the accounts, and
8 therefore the opportunity for large energy efficiency projects, is significantly larger, with
9 7,700 GWh in Minnesota versus 2,200 GWh in Colorado. This is significant because
10 industrial energy efficiency projects tend to result in large, cost-effective energy
11 savings.”²⁴ I believe that Mr. White’s implication is that this partly justifies the
12 Company’s proposal for reduced savings. However, the exemption of large industrial
13 customers from ComEd’s eligible customer base proves that the lack of large industrial
14 customers does not mean that high volumes of cost-effective energy efficiency savings
15 cannot be achieved. Even without the availability of savings from large industrial
16 customers, ComEd still proposes savings goals that are far in excess of those proposed by
17 Public Service. It is also worth noting that Vermont, which achieved over 2.5% savings
18 last year, has an industrial base consisting mostly of customers that would be considered
19 very small in any other state.

20 Because the loads of the Company’s industrial customers are on average less than they
21 are in Minnesota, the Company does not have to save anywhere near as much energy in

²⁴ Direct Testimony of Shawn M. White, pp. 19-20.

1 absolute terms. Using Company Witness White’s example above, achieving 2% savings
2 in the industrial sector in Minnesota would require 154 GWh of savings, while achieving
3 2% savings in the industrial sector for the Company would only require 44 GWh of
4 savings. It may also be true that these smaller customers do not have the level of
5 resources and experience with energy management that larger industrial customers might
6 have, which could make the opportunity for energy savings larger as a percentage of their
7 energy use than is the case for Minnesota’s larger industrials.

8 **Q. Are there any specific measures, approaches, or technologies that ComEd, BGE,**
9 **and National Grid use in these proposed portfolios that are not relevant for the**
10 **Company?**

11 A. Conservation Voltage Reduction (CVR) is a source of savings for both BGE and ComEd,
12 to varying degrees, in their proposals, and I recognize that CVR will not be counted
13 towards DSM savings for the Company, even though it is carrying out such a program
14 outside of the boundaries of DSM. CVR is not in the measure mix for National Grid,
15 however. In fact, National Grid has not yet determined exactly how it will achieve the
16 savings in each year, but that has not stopped it from committing to meet them. In
17 proposing its goals, National Grid acknowledges that “Meeting the targets set forth in this
18 Plan will require the Company to innovate and maximize customer service, energy
19 efficiency delivery, and accelerate market transformation. This holds true in each year of
20 the Plan, but is even more evident in program year 2019, where savings from unknown
21 future innovation was added to the Electric Funding Plan in order to illustrate meeting the
22 approved Targets. These energy savings can only be realized with continued
23 commitments and actions from the Company, state, and customers in addition to new

1 technologies entering the market.”²⁵ I think it is commendable that National Grid’s
2 leaders have made such a strong commitment to innovating solutions to meet its energy
3 efficiency goals.

4 **Q. The portfolios that you describe for comparison purposes are focused on 2018-2020**
5 **or 2018-2021, while Public Service is proposing targets for 2019-2023. Is the**
6 **Company’s position that savings targets should decrease in the out years of this**
7 **planning period valid?**

8 A. There are many unknowns regarding the availability of cost-effective energy efficiency
9 savings as we look beyond the next couple of years, and my analysis also suggests that
10 savings may be less available after 2020, though still higher than those proposed by the
11 Company. Public Service has not, in my view, made a compelling case for the very low
12 targets that it proposes, and my recommendation is that targets should be at higher levels.
13 While I agree that achieving high levels of savings will have challenges, setting
14 challenging targets is a necessary step in achieving high levels of savings that are
15 consistent with the Governor’s Executive Order.

²⁵ National Grid 2018-2020 Energy Efficiency and System Reliability Procurement Plan, RIPUC Docket No. 4684, August 30, 2017, p. 3.

V. GENERAL LIMITATIONS OF THE NAVIGANT POTENTIAL STUDY

Q. What is the achievable potential level of savings that the 2016 Navigant potential study identifies for Public Service?

A. The Company explains that Navigant analyzed several different savings scenarios in the Potential Study, as illustrated in Figure 9 below:

| YEAR | Annual GWh Goals ⁷ | Achievable Potential | | | |
|------|-------------------------------|----------------------|----------------------|--------------|--------------|
| | | Reference Case | Alternative Lighting | Max Benefits | Low Benefits |
| 2018 | 400 | 399 | 328 | 447 | 374 |
| 2019 | 400 | 410 | 348 | 454 | 383 |
| 2020 | 400 | 405 | 395 | 453 | 374 |
| 2021 | 400 | 336 | 329 | 369 | 306 |
| 2022 | 400 | 308 | 302 | 345 | 277 |
| 2023 | 400 | 272 | 267 | 303 | 243 |

Figure 9: Table SMW-D-1: Market Potential Assessment comparison to Proceeding No. 13A-0686EG Goals²⁶

Company Witness White states that “The Company considered the “Alternative Lighting” scenario to be the most realistic reflection of the current energy efficiency marketplace in the Company’s electric service territory.”²⁷ I discuss this issue later in my testimony and show that the Company’s preferred scenario fails to recognize several important aspects of the current market situation.

²⁶ Direct Testimony of Shawn M. White, p. 28.

²⁷ Direct Testimony of Shawn M. White, pp. 46-47.

1 **Q. Is the Alternative Lighting Scenario consistent with the savings target that the**
2 **Company proposes?**

3 A. The level of savings proposed by the Company is relatively consistent with the
4 Company's preferred scenario in the potential study. The Company's position is that
5 "potential studies must be viewed as one tool of many in developing an energy efficiency
6 portfolio."²⁸ Because of the inherent limitations of potential studies in addressing
7 emerging technologies, for example, "The Company determined that an additional 25
8 GWh should be added to the portfolio in order to account for emerging technologies and
9 potential savings from measures such as ice storage."²⁹

10 **Q. In your view, does this adjustment adequately account for the limitations of**
11 **potential studies in general, and of the Navigant 2016 potential study in particular?**

12 A. No. Emerging technologies is one specific area that potential studies in general may not
13 address adequately when they are based on a bottom-up, measure level determination of
14 savings potential. Measure level assessments of savings potential rely on being able to
15 count known quantities, and where uncertainty exists about what technologies may
16 develop, what they will cost, and what efficacy they will achieve "it would be difficult to
17 include these technologies and rely on them for the presumption of savings."³⁰

18 However, this is not the only area in which potential studies can fail to adequately
19 represent the available savings. Company Witness White states that "A potential study
20 relies on widely available assumptions about the type and amount of savings a measure

²⁸ Direct Testimony of Shawn M. White, p. 34.

²⁹ Id., p. 47.

³⁰ Id., p. 34.

1 can provide.” However, the fact that assumptions may be *widely available*, or even
2 common in an industry, does not mean that they will accurately predict the savings that
3 are available. Indeed, the Regulatory Assistance Project (RAP) published a report on
4 potential studies that found that “even within the realm of achievable savings, there can
5 be a range of projected savings depending on what assumptions are used, especially those
6 regarding possible future budget constraints and related funding streams that may support
7 energy efficiency programs.”³¹ If the assumptions used to determine achievable potential
8 are calibrated to past or typical performance, rather than optimal program performance,
9 then the estimate will be inherently conservative. The elements of program strategy and
10 design that are embedded in the comparison may not be appropriate for a study that seeks
11 to identify the full scope of achievable potential.

12 **Q. Is there evidence that the Navigant potential study is calibrated to typical**
13 **performance?**

14 A. Yes. One indication of how the 2016 Navigant potential study is calibrated to typical
15 rather than optimal performance is found in Section 5.5.2 *Review of Other DSM Potential*
16 *Studies*. Navigant’s purpose in including this comparison was to “highlight whether the
17 results of the Potential Study might be considered in the realm of what other studies in
18 the region revealed.”³² In other words to see if the achievable potential that Navigant
19 identified in the Public Service study is in the ballpark of what was found in other
20 potential studies. The problem is, if the other studies that Navigant used for calibration

³¹ Chris Kramer and Glenn Reed, “Ten Pitfalls of Potential Studies,” Regulatory Assistance Project, November 2012, p. 5, Attachment JG-2, p. 7 of 77.

³² “2016 Demand-side Management Potential Study,” Prepared for Public Service Company of Colorado, d/b/a Xcel Energy, Final Report, December 16, 2016, p. 7.

1 were also inherently conservative, then all that the comparison accomplishes is to
2 validate that it is equally conservative.

3 In the comparison, Navigant found that “the regional average of the seven studies, plus
4 this one, indicate a 0.9 percent average annual reduction, which is about 20% higher than
5 what was found in this study,”³³ so it may be even more conservative than these other
6 studies. Navigant suggests some possible reasons to explain why their study result is
7 lower than the average, though the explanation amounts to making assumptions to
8 explain other assumptions, and is not convincing. The fact that the potential study
9 identifies a “degree of achievable potential [that] is consistent with Navigant’s
10 observations of savings levels in other jurisdictions it has studied”³⁴ only supports the
11 argument that “average” is equivalent to “achievable,” without addressing how higher
12 performing jurisdictions are able to outperform these supposed limits.

13 However, there are other interesting things to observe in these data. First, while the
14 average savings potential might have been seven percent, the highest achievable potential
15 in the examples was 1.3% in Utah—nearly double the potential that Navigant identified
16 for Public Service. The comparison studies also identified potential of 1.2% in
17 Washington and 1.1% in Nevada. Navigant does not attempt to explain why there should
18 be so much less potential in Colorado than in these states. But even more interesting is
19 the fact that several states or utilities, including Public Service, exceeded the savings that
20 the potential studies identified as achievable or maximum achievable. Public Service

³³ Id.

³⁴ “2016 Demand-side Management Potential Study,” Prepared for Public Service Company of Colorado, d/b/a Xcel Energy, Final Report, December 16, 2016, p. 7.

1 achieved 0.89% savings compared with a 0.7% potential, Idaho achieved 1.13% savings
2 compared with a 0.6% potential, and Washington achieved 1.54% compared with a 1.2%
3 potential.³⁵ And these portfolios all might have been able to achieve even higher levels of
4 cost-effective savings had regulators required them to do so.

5 Company Witness White illustrates how wide the variance between potential study
6 predictions and actual results can be when he notes that “LED technologies made up
7 approximately 154 GWh...or 38% of the total portfolio achievement...much higher than
8 the 32 GWh of forecasted annual LED technology achievement identified in the prior
9 2009 DSM potential study that was updated in 2013.”³⁶ Indeed, it is nearly five times as
10 high as the potential study projection.

11 **Q. Has the Company provided evidence to explain why it is not contemplating higher**
12 **targets, given its’ ability to exceed targets in the past?**

13 In explaining why the Company does not increase its savings targets in light of historic
14 accomplishments, Company Witness White states that “past achievements do not
15 necessarily reflect future potential.”³⁷ Public Service seems to be saying that it should not
16 be expected to do better than it has in the past. However, I do not agree that the
17 Commission should not take the Company’s past performance into account when setting
18 new savings targets, as I discuss later in my testimony.

³⁵ Potential study values from Navigant 2016 Demand-side Management Potential Study, p. 98. Savings achievements from American Council for an Energy-Efficient Economy, “The 2017 State Energy Efficiency Scorecard,” p. 29 available at <http://aceee.org/sites/default/files/publications/researchreports/u1710.pdf>.

³⁶ Direct Testimony of Shawn M. White, p. 30.

³⁷ Direct Testimony of Shawn M. White, p. 47.

1 The Company’s responses to Sierra Club and NRDC Discovery indicate clearly that the
2 potential study is calibrated to historic performance. Regarding Strategic Energy
3 Management (SEM), the Company states that “the Potential Study’s model is calibrated
4 to current achievements.”³⁸ In addition, the Company states that “The rate of customer
5 awareness is governed by three parameters – initial awareness, word of mouth, and
6 advertising effectiveness. These values are determined from the baseline study and by
7 calibrating to historic program achievements and spending levels.”³⁹ This approach
8 implicitly considers past performance to represent the maximum that the utility can
9 achieve, when there is no evidence to support that position. I believe that this approach
10 has the effect of significantly under-estimating what it would be possible for Public
11 Service to cost-effectively achieve.

12 My view is bolstered by RAP’s report on potential studies, which observes that “Even
13 under a single set of budget constraints, achievable savings potential may differ in
14 practice from the level that has been projected. Other factors, such as effective program
15 design and the strength of motivation on the part of the utility, can significantly influence
16 what level of savings will ultimately be realized. As such, achievable savings projections
17 should not necessarily be considered maximum limits, even if budgetary allocations
18 cannot be increased. Instead analysts and policymakers should examine both monetary
19 and non-monetary assumptions to determine whether any improvements have not been
20 considered that might allow greater savings to be attained. Achievable savings

³⁸ Public Service response to Sierra Club and NRDC Discovery Request SC2-1.b.ii (emphasis added), Attachment JG- 3, p. 9 of 11.

³⁹ Public Service response to Sierra Club and NRDC Discovery Request SC2-4 (emphasis added), Attachment JG-3, p. 11 of 11.

1 projections should also be benchmarked against savings levels that have been attained in
2 other jurisdictions....”⁴⁰ Indeed, even the Company’s own potential study states that
3 “there can often be a difference between what is theoretically achievable and what is
4 achieved in practice.”⁴¹

5 **Q. Can you provide a specific example of an assumption that you believe causes the**
6 **Navigant study to be overly conservative in estimating the achievable savings**
7 **potential?**

8 A. Yes. In addition to specific program areas that I will discuss in a subsequent section of
9 my testimony, the assumptions that the potential study uses to determine its estimates of
10 customer participation are off the mark. Navigant explains that “a key differentiating
11 factor between the base technology and the efficient technology is the energy and cost
12 savings associated with the efficient technology.”⁴² The study used “equilibrium
13 ‘payback acceptance’ curves” to show “the proportion of customers who will accept
14 different payback periods for an energy efficiency investment...to simulate how
15 measures with differing payback periods will be accepted within each sector.”⁴³ To
16 determine the achievable potential, the study “varies incentive levels for each measure in
17 order to reach a designated simple payback time in years.”⁴⁴

⁴⁰ Chris Kramer and Glenn Reed, “Ten Pitfalls of Potential Studies,” Regulatory Assistance Project, November 2012, p. 5, Attachment JG-2, p. 7 of 77.

⁴¹ “2016 Demand-side Management Potential Study,” Prepared for Public Service Company of Colorado, d/b/a Xcel Energy, Final Report, December 16, 2016, p. 96.

⁴² Id., p. 64.

⁴³ Id., p. 65.

⁴⁴ Id., p. 69.

1 Using simple payback as the basis for estimating the number of customers who will
2 participate in programs may yield results that are “believable” by virtue of their
3 consistency with other observed results, but is suspect as the basis for estimating what is
4 truly possible to achieve within cost-effectiveness limitations. As I noted earlier, RAP
5 suggests that “policymakers should examine both monetary and non-monetary
6 assumptions”⁴⁵ in assessing potential. An evaluation of PG&E’s Whole House Retrofit
7 Program found that “the top motivations for participants are comfort, saving money by
8 reducing energy use, the incentives available and reducing their environmental impact”⁴⁶
9 yet the importance of these other factors is not considered by Navigant in estimating
10 participation rates.

11 My view that the Navigant study imposes artificial limits in using payback to determine
12 achievable potential is supported by Shelton Group, a marketing firm with extensive
13 experience in developing research-based approaches to promoting energy efficiency. In a
14 recent report on a survey of Americans’ attitudes on energy efficiency decision-making,
15 Shelton noted that “Americans think they’re motivated primarily by savings and lower
16 bills, so much so that marketers have used savings almost exclusively as the main
17 incentive to encourage energy efficiency...But this doesn’t move consumers to act.”⁴⁷

18 An article in the Harvard Business Review also argues against the notion that using
19 measures of rational decision-making will provide a reliable basis for estimating results,

⁴⁵ Emphasis added.

⁴⁶ Pacific Gas and Electric Company, “2010-2012 PG&E Whole House Retrofit Program Phase II Process Evaluation Study – PGE0302.04,” December 31, 2013, available at http://www.calmac.org/publications/2010-2012_PG%26E_Whole_House_Retrofit_Program_Phase_II_Process_Evaluation_Study_Volume_1.pdf.

⁴⁷ Shelton Group, “*Energy Pulse Special Report: Playing the Planet Card*,” available at <https://sheltongrp.com/insights/planet-card-special-report>.

1 when it says that “We are finally beginning to understand that irrationality is the real
2 invisible hand that drives human decision making. It’s been a painful lesson, but the
3 silver lining may be that companies now see how important it is to safeguard against bad
4 assumptions. Armed with the knowledge that human beings are motivated by cognitive
5 biases of which they are largely unaware (a true invisible hand if there ever was one),
6 businesses can start to better defend against foolishness and waste.”⁴⁸

7 My point here is not to argue over what motivates customers to act, but rather to illustrate
8 that Navigant’s approach will systematically underestimate what can be accomplished
9 when maximizing participation is the goal. For evidence of this, we only need look to the
10 actual experience of programs that sought to maximize participation. Lawrence-Berkeley
11 National Laboratory found that “One of the most successful programs in terms of market
12 penetration is the residential weatherization program run by Bonneville Power
13 Administration (BPA), which improved the efficiency of approximately 900,000 of 1.6
14 million eligible homes (56%) from 1980 to 1992.”⁴⁹ This is not a result that would have
15 been predicted by using payback acceptance curves, nor would Navigant’s method
16 predict the success of the Hood River Conservation Project, which “achieved a
17 remarkable response rate for home energy assessments (91% of all eligible participants)

⁴⁸ Dan Ariely: “The End of Rational Economics,” July-August 2009 Harvard Business Review, available at <https://hbr.org/2009/07/the-end-of-rational-economics>.

⁴⁹ Merrian C. Fuller, et al., “Driving Demand for Home Energy Improvements: Motivating residential customers to invest in comprehensive upgrades that eliminate energy waste, avoid high bills, and spur the economy”, September 2010, p. 18, available at <https://emp.lbl.gov/sites/default/files/report-low-res-bnl-3960e.pdf>.

1 as well as for the subsequent implementation of conservation measures (85% of all
2 eligible participants) over 3 years.”⁵⁰

3 **Q. What then, would you propose as a better way to determine customer participation**
4 **rates?**

5 A. First, I believe that the purpose of an achievable potential study is to make an informed
6 determination of what could be achieved through optimal program outreach and delivery
7 using incentives and other mechanisms that will generate high acceptance rates from
8 potential participants, not to determine reasonable estimates for program participation
9 that are grounded in the average accomplishments of existing utility programs. The latter
10 approach, which is what Navigant appears to have done in its study, is guaranteed to
11 result in average savings forecasts, because its validity is grounded in comparisons with
12 average programs.

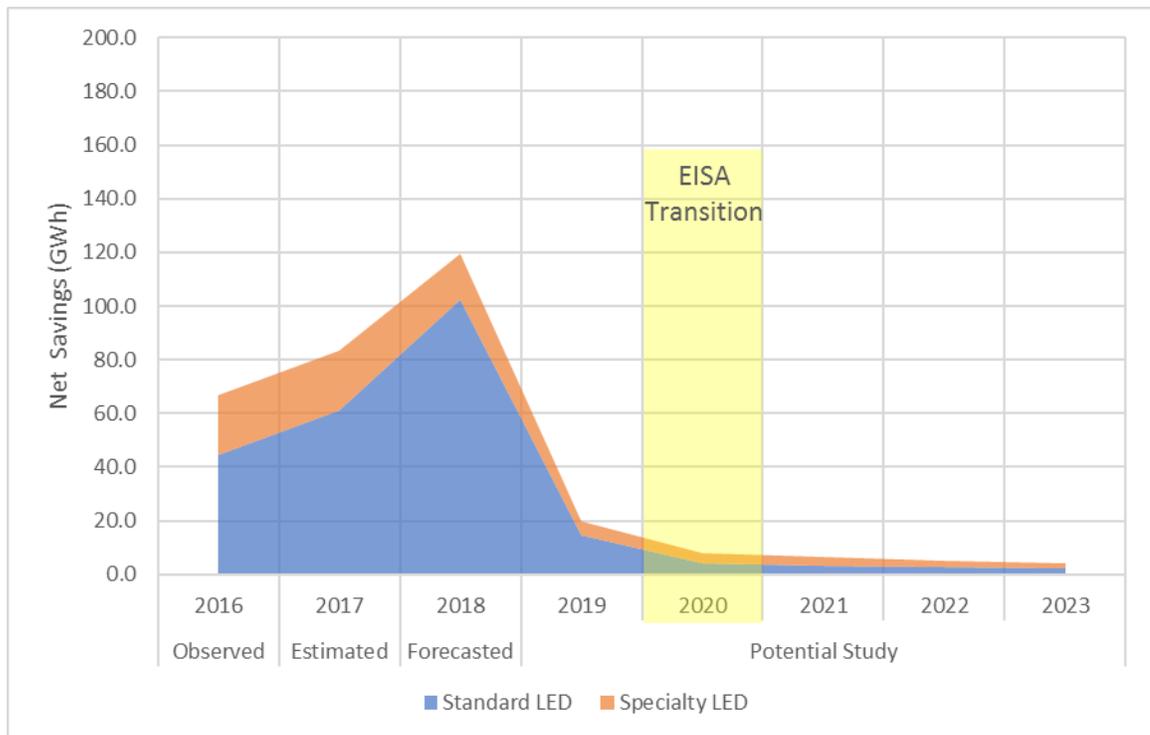
13 The concept of “achievable potential” should be interpreted as meaning that which could
14 be accomplished with the best application of knowledge, experience, and enthusiasm.

15 Making the financials work for potential participants is important, but estimating program
16 uptake should also include a determination of what level of uptake could be generated
17 through aggressive, highly successful communications strategies.

18 For example, consider a study conducted by Lawrence-Berkeley National Lab in 1997-98
19 on the potential effect that tax credits could have on the adoption of certain efficient
20 products. The researchers found that “the act itself of instituting a public subsidy,

⁵⁰ Id., p.19.

1 in the 2009 potential study (32 GWh).⁵² Of this 2016 total, 66.9 GWh are attributed to
2 the Home Lighting and Recycling Program.⁵³ This level of residential LED savings is
3 anticipated to grow in 2017 and 2018 based on the Company’s own information.⁵⁴ The
4 Company’s 2016-2018 residential LED savings stand in stark contrast to the Navigant
5 Potential Study “Alternative Lighting” scenario estimates, as shown in Figure 10.



6
7 **Figure 10: Residential LED Bulb Savings in Navigant Potential Study “Alternative Lighting”**
8 **Scenario**

⁵² Direct Testimony of Shawn M. White, p. 30.

⁵³ 2016 results from Public Service Company Response to First Discovery Request of the Sierra Club and NRDC, Discovery Request SC1-8, Attachment JG-3, p. 6 of 11.

⁵⁴ 2017 forecast based on Public Service Company Response to First Discovery Request of the Sierra Club and NRDC, Discovery Request SC1-5, Attachment JG-3, pp. 2-3 of 11; results as of 9/30/17 were scaled by 1.33 to estimate the full year total. 2018 forecast based on Public Service Company Response to First Discovery Request of the Sierra Club and NRDC, Discovery Request SC1-6, Attachment JG-3, p. 5 of 11.

1 With high levels of participation in recent years, and residential LED socket saturation at
2 only 6.9% according to the Cadmus Colorado Lighting Market Study, there is no reason
3 to believe that residential LED participation and savings will drop dramatically in 2019
4 as estimated by Navigant. Should the Commission direct the Company to pursue its
5 preferred, reduced savings option, the magnitude of the savings that the Company would
6 not realize in residential lighting promotions alone would be enormous.

7 Second, the implementation of EISA will likely have delays, which will result in the
8 continued availability of lighting savings from certain categories of residential LED
9 products. Company Witness Beaman stated that “based on past experience with phase
10 one of the EISA legislation during 2012-2014, there will be significant availability of
11 standard-efficiency halogen lights, either for sale, through shelf-stocking, or hoarding
12 practices beyond January 1, 2020.”⁵⁵ Based on this past experience, and since no federal
13 funding has been allocated for EISA enforcement, the view that its implementation will
14 be delayed is likely to be correct. As such, it is reasonable to assume that a residential
15 LED program offering can be effective in capturing savings through 2020.

16 **Q. Do you recommend that the Company plan to continue to pursue promotions of**
17 **standard LED bulbs?**

18 A. Yes. Given the urgency of the Executive Order I believe that the Company should
19 maximize its savings in the near term while it continues to develop alternate approaches
20 to increasing savings from measures other than standard lighting.

⁵⁵ Public Direct Testimony and Attachments of Donna A. Beaman, p. 44.

1 **Q. Do the circumstances that you have described regarding standard lighting apply**
2 **equally to “specialty” lighting products, such as globes, decorative, and reflector**
3 **lighting?**

4 A. No, they do not, for the simple reason the EISA standards apply to “General Service
5 Lighting” only, which does not include specialty lighting products. While the definition
6 of bulb types covered by the General Service Lighting category was recently revised to
7 include specialty bulbs, this change is under appeal.⁵⁶ Because the outcome is uncertain, I
8 recommend that the Company’s plans include promotion of specialty bulbs.

9 **Q. Does the Company address this specialty bulb issue in its filings?**

10 A. Yes, Company Witness Beaman confirms that the “Company also assumes the final DOE
11 decision expanding the list of affected bulbs will not be enforced, and the adjusted
12 baseline described below will only be applicable to A Lamp bulbs.”⁵⁷ Unfortunately the
13 Navigant study ignores this, instead indicating that volumes of specialty bulbs will
14 decrease, despite the low current levels of LED market saturation reported in the Cadmus
15 Colorado Lighting Market Study (“Cadmus”).⁵⁸ And, while the costs of LED specialty
16 bulbs have typically been much higher than either standard LED bulbs or inefficient
17 alternatives, these costs are declining as the products become more mature. This also
18 suggests that the Company can capture significantly more savings through promotion of

⁵⁶ See, e.g., news release from the National Electrical Manufacturers Association, “NEMA Calls on Secretary of Energy to Complete Rulemaking for General Service Lamps,” (Apr. 27, 2017), available at <http://www.nema.org/news/Pages/NEMA-Calls-on-Secretary-of-Energy-to-Complete-Rulemaking-for-General-Service-Lamps.aspx>.

⁵⁷ Public Direct Testimony and Attachments of Donna A. Beaman, p. 43.

⁵⁸ The Cadmus Colorado Lighting Market Study indicated a 6.9% saturation rate for all residential screw-in LED products (table 8), DAB-2, p. 20.

1 residential lighting products than either the potential study or their proposed savings
2 levels indicate.

3 **Q. What is the Company’s position regarding the availability of lighting savings in the**
4 **near term?**

5 A. The Company acknowledges that residential lighting will continue to be an important
6 potential source of savings, but this is not adequately represented in its proposed targets.
7 Company Witness Beaman states that “Although it is clear that LED lighting sales have
8 increased in the past few years, customers continue to purchase and install a high volume
9 of inefficient bulbs. Therefore, energy efficient lighting products are still necessary.”⁵⁹
10 Company Witness Beaman also cites NEMA data, stating that “The 2016 third-quarter
11 NEMA data indicates that LED bulbs are growing and have reached a penetration of 32
12 percent of bulb shipments. However, the majority of bulbs shipments were halogen and
13 incandescent at a combined penetration of 54 percent.”⁶⁰ The most recent NEMA sales
14 data are shown below in Figure 11, confirming Witness Beaman’s statement that a
15 majority of lighting shipments nationally remain inefficient halogen and incandescent
16 bulbs.

⁵⁹ Public Direct Testimony and Attachments of Donna A. Beaman, p. 43.

⁶⁰ Public Direct Testimony and Attachments of Donna A. Beaman, p. 43.

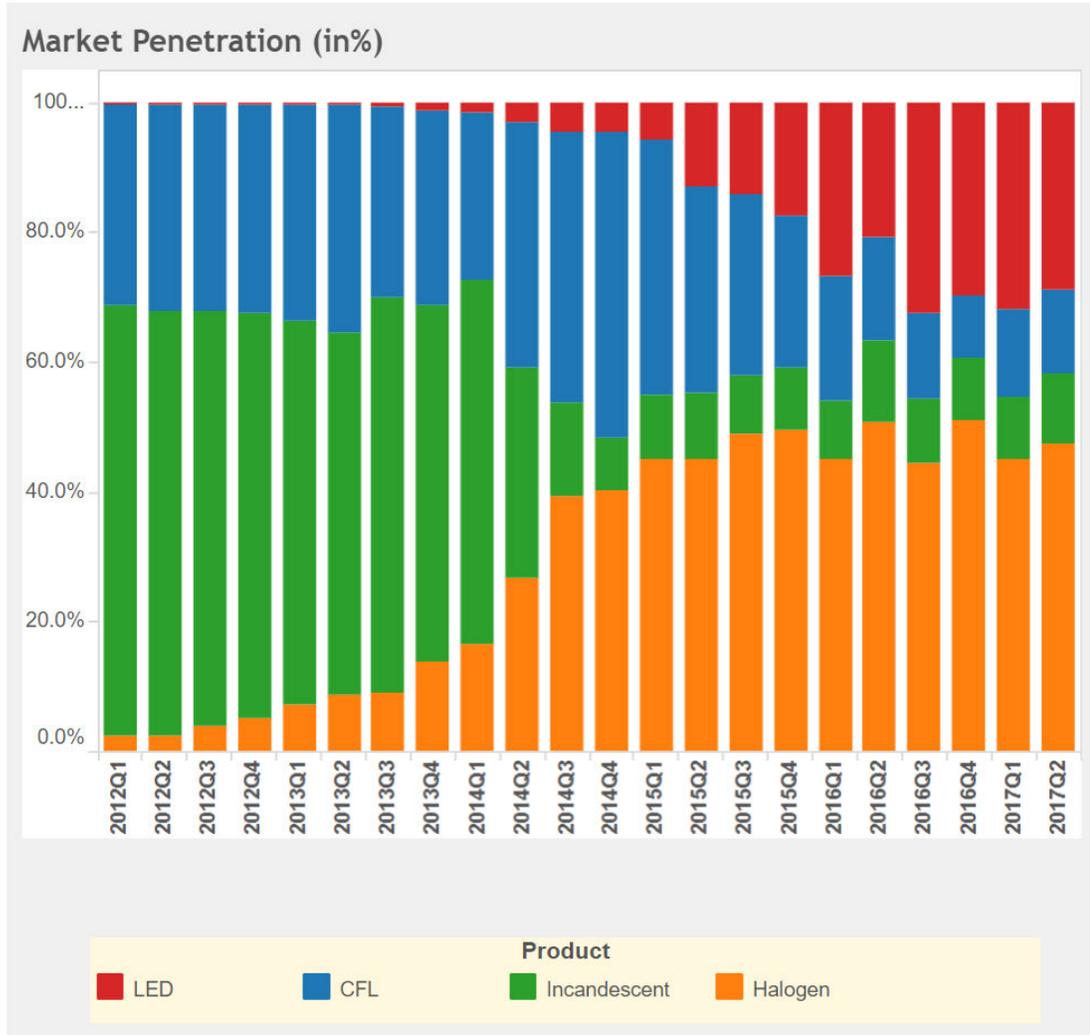


Figure 11: NEMA Lamp Sales Market Penetration⁶¹

Q: What would a more realistic savings forecast for residential lighting look like for 2019-2023?

A: Figure 12 shows what is, in my view, a plausible forecast of the cost-effective savings that the Company can expect to get from residential lighting promotions over the next several years.

⁶¹ <http://www.nema.org/Intelligence/Pages/Lamp-Indices.aspx>

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Figure 12: Residential LED Bulb Savings Revised Scenario

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Q. What about commercial lighting savings? Do the Company’s proposed targets omit commercial lighting savings at the scale of residential lighting?

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6

A. The Company’s proposed targets also neglect the opportunity to capture significantly more lighting savings from commercial customers. The commercial market is dominated by linear fluorescent lighting, with nearly 1.1 billion fixtures nationally according to the U.S. Department of Energy (DOE).⁶² Indeed, the Cadmus Colorado Lighting Study found that fluorescent technology represents 77% of the lighting equipment for commercial customers. In the Company’s service territory, approximately 14.7 million

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⁶² Navigant Consulting, “Adoption of Light-Emitting Diodes in Common Lighting Applications,” DOE, Section 4.6, p.33, 2017, available at https://energy.gov/sites/prod/files/2017/08/f35/led-adoption-jul2017_0.pdf.

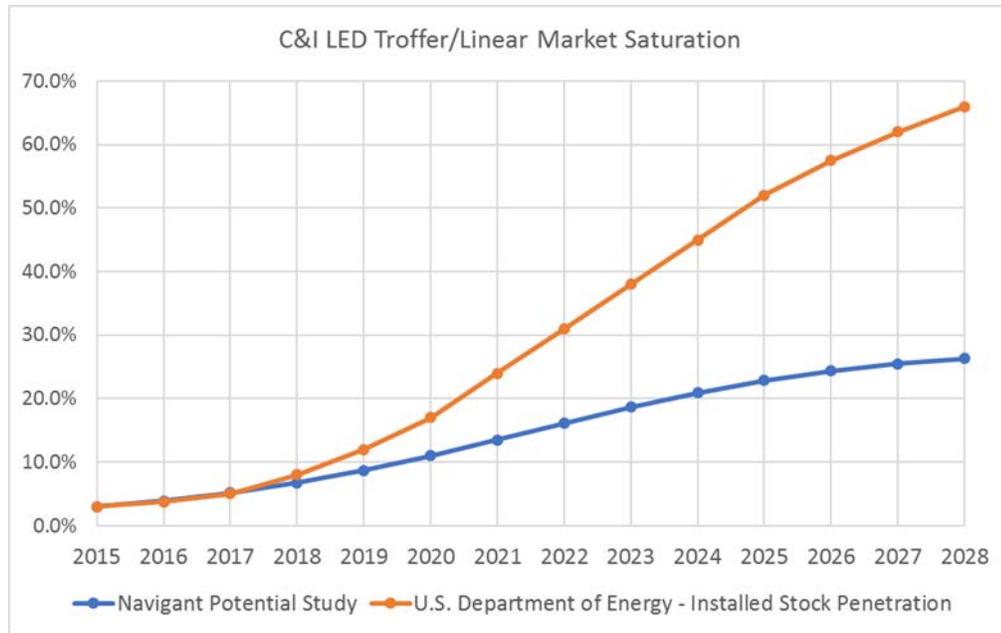
1 linear fluorescent fixtures exist at commercial & industrial sites.⁶³ LED products – both
2 replacement tubes and whole fixtures – are widely available as an energy-saving upgrade
3 option for this product category, yet the level of adoption is low. The Cadmus study
4 found less than 1% installed linear LED lighting in 2015, and the U.S. Department of
5 Energy more recently estimated that only 3% of the installed linear product stock is
6 LED.⁶⁴

7 Figure 13 shows the gap between Navigant’s projected market saturation for these
8 products and the potential that the U.S. Department of Energy projects. The DOE
9 projection represents the expected future path for LED lamps and luminaires given
10 continuation of current levels of solid-state lighting (SSL) investment and effort from
11 DOE and industry stakeholders.⁶⁵

⁶³ Based on the U.S. DOE national inventory estimate of 1.1 billion fixtures in the U.S., scaled to Public Service territory using 2016 U.S. Census estimates, available at https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=PEP_2016_PEPANNRES&sr=c=pt, Colorado utility sales data, and commercial market prevalence of linear lighting, available at <https://www1.eere.energy.gov/buildings/publications/pdfs/ssl/2010-lmc-final-jan-2012.pdf>.

⁶⁴ Navigant Consulting, “Energy Savings Forecast of Solid State Lighting in General Illumination Applications, DOE, “Table 4.14, September 2016, p. 41, available at https://energy.gov/sites/prod/files/2016/09/f33/energysavingsforecast16_2.pdf.

⁶⁵ Navigant Consulting, Energy Savings Forecast of Solid State Lighting in General Illumination Applications, DOE, Table 4.14 and Figure 4.24, pp. 41-42, September 2016, available at https://energy.gov/sites/prod/files/2016/09/f33/energysavingsforecast16_2.pdf.



1

2

Figure 13: Commercial LED Troffer/Linear Market Saturations

3

Q. Are there other factors in the Navigant Potential Study that affect the assumed adoption of this product category?

4

5

A. Yes, there are two additional issues. First, I believe that Navigant’s estimate of future price reductions for LED linear/troffer products is conservative, and this certainly contributes to the under-estimation of savings potential. This is illustrated in Figure 14 below, which compares the Navigant projection to that of the price forecast produced by the U.S. Department of Energy.⁶⁶

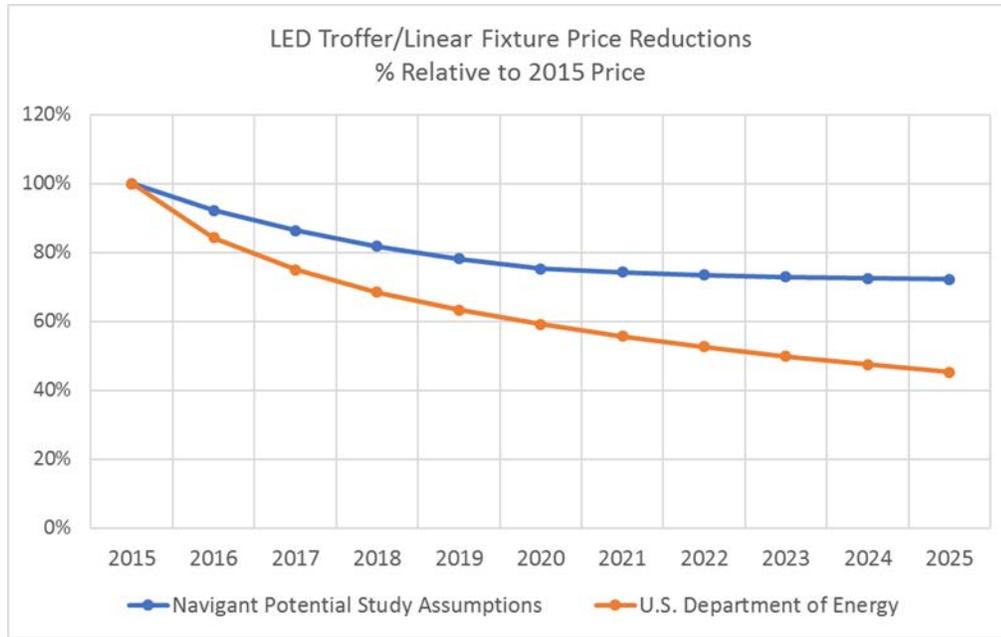
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⁶⁶ Navigant Consulting, Energy Savings Forecast of Solid State Lighting in General Illumination Applications, DOE, table D-2 , p. 75, September 2016, available at https://energy.gov/sites/prod/files/2016/09/f33/energysavingsforecast16_2.pdf.



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Figure 14: Navigant VS. DOE Estimates of LED Linear Product Price Reductions

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Second, Navigant did not account for future performance improvements for these

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products, in contrast to the U.S. government projections for significant efficacy

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improvements. Better performance will benefit the Company in two ways, by allowing it

6

to claim greater savings per unit, and by increasing the rate of adoption due to

7

significantly improved customer economics. Figure 15 shows that LED linear fixture

8

efficacy – for both lamps and luminaires – is expected to increase by nearly 25% between

9

2015 and 2020, and by another 15% between 2020 and 2025.

Table D-4 LED Lamp and Luminaire Efficacy Projections and Descriptions by Application (lm/W)

| Application Submarkets | | 2015 | 2020 | 2025 | 2030 | 2035 |
|------------------------|-------------------------|------|------|------|------|------|
| LED Lamps | A-Type Lamps | 79 | 97 | 111 | 123 | 133 |
| | Downlight/Track - Large | 67 | 81 | 92 | 101 | 108 |
| | Downlight/Track - Small | 61 | 72 | 80 | 87 | 93 |
| | Linear Fixture | 112 | 137 | 157 | 174 | 187 |
| | Low and High Bay | 83 | 109 | 129 | 145 | 159 |
| | Decorative | 66 | 89 | 108 | 122 | 135 |
| | Area and Roadway | 71 | 97 | 117 | 133 | 147 |
| | Parking Lot | 71 | 97 | 117 | 133 | 147 |
| | Garage | 112 | 137 | 157 | 174 | 187 |
| | Building Exterior | 69 | 89 | 104 | 117 | 127 |
| LED Luminaires | Decorative | 72 | 90 | 105 | 116 | 126 |
| | Downlight/Track - Large | 77 | 101 | 120 | 135 | 148 |
| | Downlight/Track - Small | 77 | 101 | 120 | 135 | 148 |
| | Linear Fixture | 99 | 123 | 142 | 158 | 171 |
| | Low and High Bay | 100 | 121 | 138 | 152 | 164 |
| | Area and Roadway | 86 | 105 | 120 | 132 | 142 |
| | Parking Lot | 86 | 105 | 120 | 132 | 142 |
| | Garage | 89 | 105 | 118 | 128 | 136 |
| Building Exterior | 89 | 115 | 136 | 153 | 167 | |

1

2

Figure 15: U.S. Government projections of LED efficacy improvements⁶⁷

3

Q. After adjusting for these factors, how much more savings do you think the

4

Company can achieve from Linear LED products than it proposes?

5

A. I believe that over the 2019-2023 planning horizon the Company can achieve more than

6

three times the savings from Linear LED products than is projected in the Navigant

7

study, as illustrated in Figure 16.

| | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
|-------------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Navigant LED Troffer/Linear Savings | 14.7 | 17.1 | 18.8 | 19.4 | 18.7 | 88.6 |
| Revised LED Troffer/Linear Savings | 36.0 | 46.7 | 67.1 | 68.7 | 70.0 | 288.5 |
| Net Total Change | 21.3 | 29.6 | 48.3 | 49.3 | 51.4 | 199.9 |

8

⁶⁷ Navigant Consulting, "Energy Savings Forecast of Solid State Lighting in General Illumination Applications," table D-4, September 2016, p. 80, available at https://energy.gov/sites/prod/files/2016/09/f33/energysavingsforecast16_2.pdf.

Figure 16: LED Troffer/Linear LED Savings

Q. Can advanced lighting controls contribute even more savings?

A. Advanced Lighting Controls (ALC), also known as Networked Lighting Controls (NLC) or Connected Lighting, combine multiple control strategies in one system, including at a minimum occupancy control, daylight control, high-end trim, scheduling, and manual dimming. In addition, all devices are networked, enabling intelligent and coordinated control. The result is a greater level of savings compared to stand-alone control devices like occupancy sensors and daylight sensors. The U.S. Department of Energy ranks LED linear fixtures with advanced controls as the top lighting savings opportunity across all sectors.⁶⁸

According to the DOE, the non-connected linear LED category (fixtures and lamps) represents 18% of the potential lighting savings nationally. But this increases to 32% of the potential lighting savings when paired with connected controls. The DOE has established a goal for adoption of connected LED luminaires, shown below in Figure 17.

| DOE SSL Program Goals | Connected LED Luminaires (%) | <1% | 15% | 31% | 43% | 59% |
|-----------------------|------------------------------|-----|-----|-----|-----|-----|
| | Commercial | <1% | 28% | 52% | 66% | 73% |
| Residential | <1% | 1% | 4% | 13% | 29% | |
| Industrial | <1% | 16% | 42% | 60% | 66% | |
| Outdoor | <1% | 9% | 37% | 63% | 77% | |

Figure 17: DOE Installed Penetration of Connected-LED Luminaires (Relative to Non-Connected)⁶⁹

⁶⁸ Navigant Consulting, “Adoption of Light-Emitting Diodes in Common Lighting Applications,” DOE, figure 4.4, July 2017, available at https://energy.gov/sites/prod/files/2017/08/f35/led-adoption-jul2017_0.pdf.

⁶⁹ Navigant Consulting, “Energy Savings Forecast of Solid State Lighting in General Applications, DOE,” table 4.4, September 2016, available at https://energy.gov/sites/prod/files/2016/09/f33/energysavingsforecast16_2.pdf.

1 If connected linear LED fixtures and lamps were adopted at this rate in the Company’s
 2 territory, the potential savings would be significant as shown in Figure 18:

| | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
|--|---------|---------|---------|---------|---------|-----------|
| Connected LED Troffer/Linear Fixtures | 132,762 | 206,518 | 338,690 | 388,254 | 437,818 | 1,504,041 |
| Additional Savings from Controls (GWh) | 11.3 | 17.6 | 28.8 | 33.0 | 37.2 | 127.8 |

3
 4 **Figure 18: Additional savings potential from adoption of connected linear LED fixtures and lamps**

5 **Q. Are there other measures in the potential study for which savings are**
 6 **underestimated because they do not reflect anticipated performance improvements?**

7 A. Navigant also failed to reflect anticipated performance improvements for exterior
 8 lighting. Even without adjusting the expected market penetrations for efficient exterior
 9 lighting, simply adjusting the savings to reflect these performance improvements
 10 increases the expected savings over the five-year period in question by 33%, as illustrated
 11 in Figure 19 below:

| | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
|-------------------------------|------------|------------|------------|------------|------------|------------|
| Navigant LED Exterior Savings | 5.4 | 5.4 | 5.2 | 5.1 | 4.9 | 26.0 |
| Revised LED Exterior Savings | 6.7 | 7.0 | 7.0 | 7.0 | 6.9 | 34.6 |
| Net Total Change | 1.3 | 1.6 | 1.8 | 1.9 | 2.0 | 8.6 |

12
 13 **Figure 19: Increased savings due to performance improvements in exterior lighting**

14 **Q. In addition to the measure/technology issues that you provide examples for above,**
 15 **are there program delivery approaches that could lead the Company to achieve**
 16 **greater levels of savings than it projects?**

17 A. Yes. For example, aggressive use of Strategic Energy Management (SEM) could provide
 18 greater savings than projected. While the Company responded in discovery that it does
 19 employ SEM and that it’s savings are already captured at the measure level in the

1 Navigant study, I believe that the approach of estimating savings potential for SEM based
2 only on an accumulation of installed measures fails to reflect both the nature of the
3 approach and the significant savings opportunities that can result from effective
4 implementation.

5 **Q. Please describe the basis of your suggestion that characterization of SEM savings**
6 **simply based on accumulation of installed measures is insufficient.**

7 A. SEM is a continuous improvement approach that creates persistent energy and cost
8 savings for industrial and other large customers by integrating energy management into
9 organizational practices, policies, and processes – similar to systems used with quality
10 assurance, safety, or productivity. SEM focuses on changes in daily operations that
11 engage staff at all levels of an organization to reduce energy waste and improve energy
12 intensity. Benchmarking, tracking, and monitoring of building energy and asset
13 information are integrated elements of data-driven strategic energy management. SEM
14 programs are fundamentally about investing in end user capacity and organizational
15 change, in order to achieve holistic improvements in the ways that energy is used. While
16 there will be savings that occur as a result of specific measure installations, these savings
17 may be small compared with the persistent operational changes that SEM can produce.

18 **Q. Could SEM be used to capture more savings for the Company?**

19 A. Yes. A 2015 evaluation conducted by CLEAResult of SEM programs administered by
20 Energy Trust of Oregon, Bonneville Power Administration, and AEP Ohio, found that
21 128 industrial sites had an average first year annualized SEM program savings equal to

1 4.8% of facility energy use with a peak savings of nearly 20%.⁷⁰ Results solely from AEP
2 Ohio, shown below in Figure 20, indicate that 37 participants saved 40.1 GWh in 2014
3 and 37.7 GWh in 2015 (partial year).

| | Months in program | Number of participants | Segment type of participants | 2014MWh Savings | 2015MWh Savings to date | Total MWh Savings to date | Average Savings as a % of load |
|----------|-------------------|------------------------|------------------------------|-----------------|-------------------------|---------------------------|--------------------------------|
| Cohort 1 | 24 | 14 | Large Manufacturing | 21,100 | 20,700 | 41,800 | 8.6% |
| Cohort 2 | 20 | 7 | Large Manufacturing | 7,000 | 10,000 | 17,000 | 7.5% |
| Cohort 3 | 17 | 7 | Large Manufacturing | 4,000 | 2,600 | 6,600 | 4.2% |
| Cohort 4 | 16 | 9 | Large Manufacturing | 8,000 | 4,400 | 12,400 | 2.4% |

4
5 **Figure 20: AEP Ohio SEM Results, 2014-2015⁷¹**

6 These are significant savings, and the Company's point about the relatively small size of
7 its industrial customer base notwithstanding, suggest that an aggressive approach to SEM
8 using industry best practices could also be an effective tool for increasing savings for the
9 Company.

10 **Q. Can you provide another example of a program approach that could be used to**
11 **capture more savings?**

12 A. Another example of an approach that the Company could use to capture more savings is
13 enhanced use of midstream promotion of residential HVAC products, noting that Public
14 Service already uses a midstream approach to promote commercial HVAC products.

⁷⁰ Dave Worsley, et al., "Success Factors for Utility-Sponsored Strategic Energy Management Initiatives," 2015, available at <http://aceee.org/files/proceedings/2015/data/papers/1-131.pdf>.

⁷¹ Jess Burgess, et al., "The Second Generation of Strategic Energy Management Programs," 2015, available at <http://aceee.org/files/proceedings/2015/data/papers/1-31.pdf>. I relied on this report in developing my opinion about SEM.

1 **Q. What is a midstream incentive program?**

2 A. In a midstream program, incentives are applied at the point of purchase for products sold
3 through wholesale distributors. Experience with this approach has shown that energy
4 efficient products achieve higher levels of sales penetration, and reach a greater number
5 of customers than in conventional rebate programs, due to: (1) reductions in cost
6 premiums over standard efficiency products at the point of purchase; (2) increased
7 distributor stocking of high efficiency products; (3) ease of customer/contractor
8 participation with little to no paperwork; and (4) the capture of sales made under duress
9 due to equipment failure. Meanwhile, ratepayer programs often benefit from reduced
10 administration costs because applications are submitted in batches (typically monthly)
11 and implementation happens through a relatively small number of market actors.

12 **Q. Are there examples of successful midstream residential HVAC programs at other**
13 **utilities?**

14 A. Yes, multiple utilities have offered residential midstream HVAC programs. Examples
15 include Efficiency Vermont, MassSave, Energize Connecticut,⁷² Pacific Gas & Electric,⁷³
16 and NYSERDA.⁷⁴ Products commonly promoted include high efficiency boilers,
17 furnaces, water heaters, and air conditioning units. Midstream programs can be especially
18 effective in increasing sales for efficient products that have little or no market share to
19 begin with. Efficiency Vermont's midstream high-performance circulator pump (HPCP)

⁷² Stephen Bickel et al., "Swimming to Midstream: New Residential HVAC Program Models and Tools," 2016, available at https://aceee.org/files/proceedings/2016/data/papers/7_888.pdf.

⁷³ PG&E, "Learn about PG&E distributor programs," available at https://www.pge.com/en_US/for-our-business-partners/channel-partners/partner-distributor-programs/partner-distributor-programs.page.

⁷⁴ NYSERDA, "Energy Smart Products Upstream HVAC Program," November 2011.

1 and heat pump water heater (HPWH) programs fall into this category. As shown in
2 Figure 21, HPCPs and HPWHs experienced dramatic growth through the midstream
3 program. Cold climate heat pumps (CCHP) also experienced significant growth, though it
4 seems more modest relative to the extraordinary increases in the other measures.

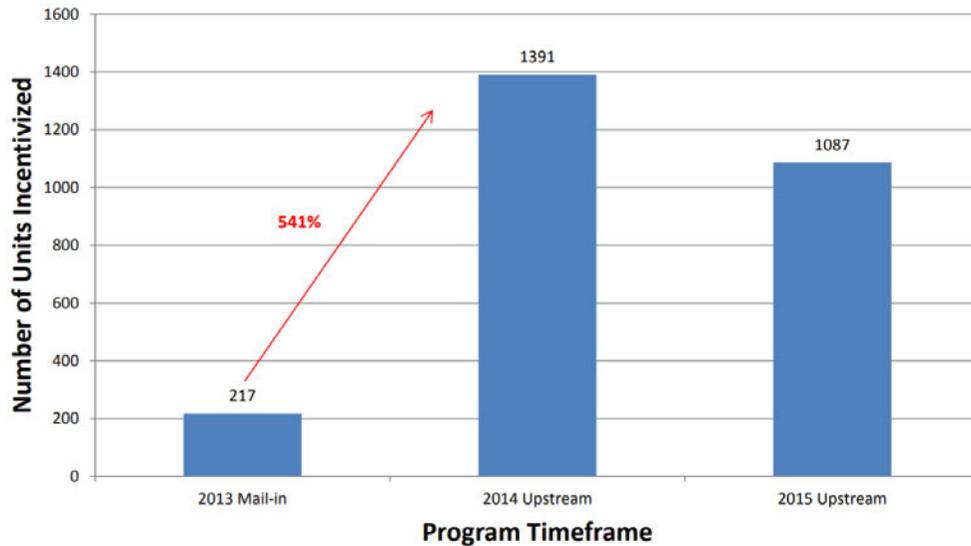
| | HPCP | HPWH | CCHP |
|--------------------------------|-------------|-------------|-------------|
| Before the initiative | 50 | 215* | 1,324* |
| Upstream initiative | 4,324 | 1,795 | 1,904 |
| Increase / (decrease) in sales | 8,548% | 734% | 44% |

5 *Estimated from supply channel feedback

6 **Figure 21: 2015 Efficiency Vermont Residential Midstream HVAC Program Results⁷⁵**

7 Connecticut had a similar experience with their residential water heater midstream
8 programs. As shown in Figure 22, sales of heat pump water heaters grew by 541% when
9 the midstream program was launched in 2014. Connecticut also noted non-energy
10 benefits of stronger HVAC partner relationships and reduced program administration
11 costs.

⁷⁵ “The Supply Chain Was Just Sitting There: How an Energy Efficiency Program Exceeded Its Goals and Transformed the Upstream Marketplace” (AESP 2017 National Conference).



1

2

Figure 22: Energize Connecticut Heat Pump Water Heater Program Results⁷⁶

3

Q. You have identified several program areas where the Company could achieve significantly greater savings than it reflects in its proposed targets. Are there others?

5

6

A. I have not examined every program area and technology. However, because it represents an important, yet historically underserved market, I did look at the Company's reported results for its Low Income Multifamily Weatherization program and compared them with the forecasts for this sector in the potential study. In the case of this program, even if one accepts the potential study results at face value, the Company's historic achievements are only about half of what the study suggests it could achieve. This is shown in Figure 23 below.

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⁷⁶ Energize Connecticut, "Energize CT Hot Water Program," Feb. 23, 2016, available at http://aceee.org/sites/default/files/files/pdf/conferences/hwf/2016/Parsons2_Session4C_HWF16_2.23.16.pdf.

| Historic Results | | | Potential Study Alternative Lighting Scenario | | | | | | |
|------------------|------|------|---|------|------|------|------|------|-----|
| 2014 | 2015 | 2016 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | |
| GWh Savings | 1.9 | 1.9 | 2.3 | 4.2 | 4.2 | 4.2 | 3.8 | 4.4 | 4.4 |

Figure 23: Public Service’s Low Income Multifamily Weatherization Program⁷⁷

Q. The difference in magnitude between historic savings achievements and the Potential Study forecast are small relative to the portfolio. Why do you identify this program in particular?

A. The low income multifamily market sector is, in many parts of the country, an underserved subset of the housing market, despite its importance. I’m pleased to see that the Company has a program that is specifically targeted to this market, but there are two things that concern me. First, I am concerned that, given its importance, the Company does not seem to be making greater efforts to meet the potential savings that are available. Energy efficiency benefits occupants of affordable multifamily housing by reducing energy costs, regardless of whether those costs are directly paid by tenants or building owners. Where they are paid by building owners, the dampening effect on operating costs provided by energy efficiency can help keep affordable housing affordable, providing a valuable societal benefit. The Commission recognized these benefits when it required the Company to reflect a 25% non-energy benefits adder in the

⁷⁷ 2014 Net Savings at the generator are from 2014 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Docket No. 13A-0773EG, April 1, 2015. 2015 Net Savings at the generator are from 2015 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Proceeding No. 14A-1057EG, March 30, 2016. 2016 Net Savings at the generator are from 2016 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Proceeding No. 14A-1057EG, March 31, 2017. Potential Study data are from Public Service Company response to OCC 1-2, Attachment OCC1-2K, Tab “ElecEnergy_CustSeg”, Row 23, columns BS-BX.

1 cost-effectiveness screening for low-income programs, and reinforced its position in
2 stating that it “direct[s] Public Service to give low-income customers special attention
3 and substantial commitment because of their unique needs and challenges. Public Service
4 should not forego DSM programs for low-income residential and multi-family housing
5 simply because they do not pass the MTRC test.”⁷⁸

6 Second, I am concerned that if the underestimation that I have identified in the segments
7 of the potential study discussed above pervades the study, then the savings
8 potential—and the resultant need—that the Company is not meeting is even greater than
9 it appears. Given the importance of providing robust efficiency programs for the low-
10 income sector, it is critical that the Company not underestimate the cost-effective savings
11 potential in this sector, and further that it proposes savings targets that are in line with the
12 potential.

13 **VII. PUBLIC SERVICE HAS A HISTORY OF UNDERESTIMATING THE RESULTS IT**
14 **CAN ACHIEVE**

15 **Q Is there other evidence you can provide to support your position that the Company**
16 **can achieve greater savings than it proposes?**

17 **A.** Yes. Looking at the Company’s reported savings and costs for the most recent three full
18 years of program implementation shows a consistent pattern of over-achieving savings
19 relative to targets while under-spending available budgets, as shown in Figure 24 below.

⁷⁸ “In the Matter of the Application of Public Service Company of Colorado for Approval of a Number of Strategic Issues Relating to Its Demand Side Management Plan,” Docket No. 13A-0686 EG, Decision No. C14-0731 at 27 (adopted May 28, 2014).

1 While I recognize that it is beneficial to ratepayers for the Company to meet its targets for
 2 less cost than projected, I think it would be more beneficial to achieve greater savings for
 3 more customers by using the full available budgets.

| | 2014 | 2015 | 2016 | Average |
|--------------------|------|------|------|---------|
| % Savings forecast | 104% | 104% | 103% | 104% |
| % budget forecast | 88% | 91% | 91% | 90% |

4

5 **Figure 24: Public Service reported 2014-2016 savings and spending vs. budget⁷⁹**

6 If the Company had fully expended the budgets for each of these years, obtaining savings
 7 at the same overall cost per kWh saved as it did for its reported savings, the additional
 8 savings would have been significant, as seen in Figure 25:

| | 2014 | 2015 | 2016 | Average |
|--|------|------|------|---------|
| Reported Savings | 392 | 406 | 410 | 403 |
| Percent increase in savings if 100% of budget used | 18% | 14% | 13% | 15% |
| Savings that could be achieved at full budget | 463 | 463 | 464 | 464 |
| GWh Increase over reported savings | 71 | 58 | 54 | 61 |

9

10 **Figure 25: Increased 2014-2016 savings available by fully expending budgets⁸⁰**

11 For the three- year period from 2104-2016, the Company could have achieved an average
 12 of 15% more savings than it did, simply by fully expending the available budgets. This
 13 pattern is so consistent that it argues for increasing the Company’s targets by 15%,
 14 simply on the basis of this information, even without the detailed review of specific

⁷⁹ 2014 Net Savings at the generator are from 2014 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Docket No. 13A-0773EG, April 1, 2015. 2015 Net Savings at the generator are from 2015 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Proceeding No. 14A-1057EG, March 30, 2016. 2016 Net Savings at the generator are from 2016 “Demand-Side Management Annual Status Report,” Electric and Natural Gas, Public Service Company of Colorado, Proceeding No. 14A-1057EG, March 31, 2017.

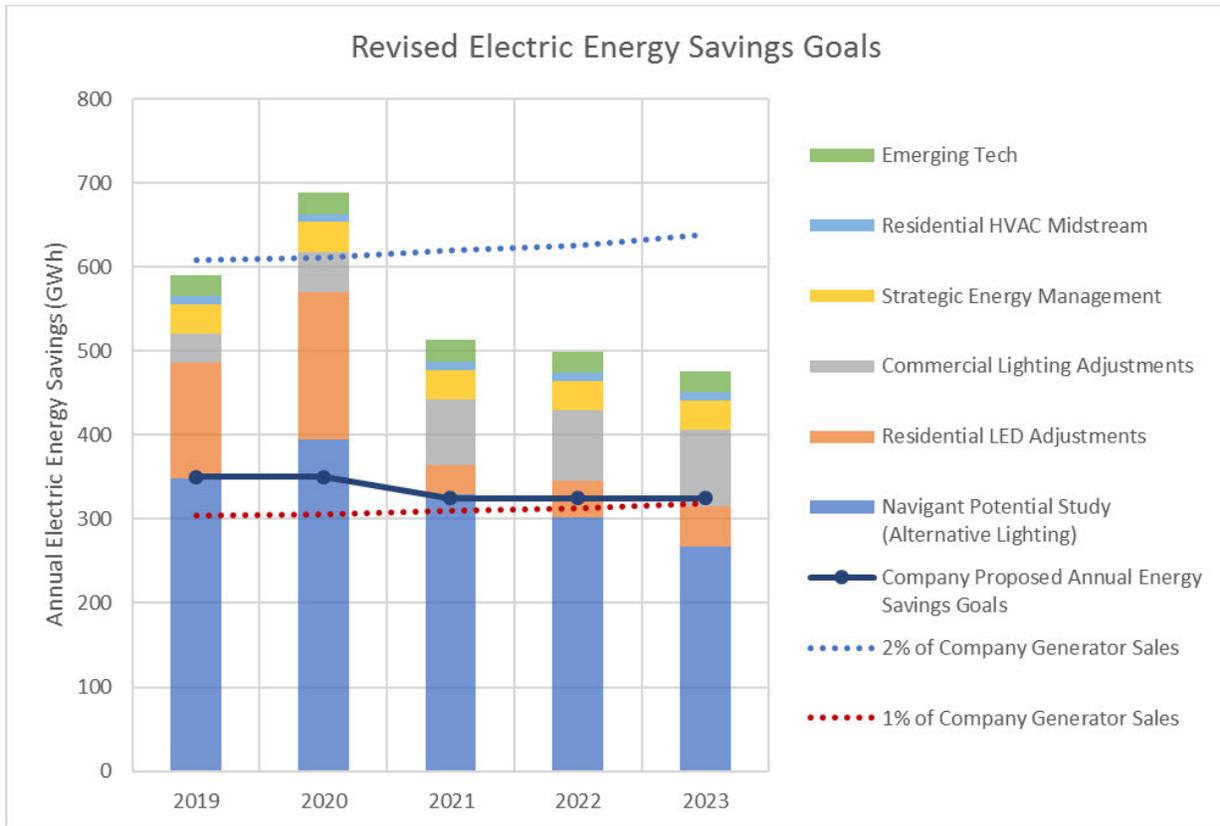
⁸⁰ Id.

1 program areas that I have provided above. This alone would suggest that the Company
2 could increase its proposed 350 MWh/year target and meet its current 400 GWh/year
3 targets for 2019 and 2020, and that it could nearly meet the 400 GWh/year target for
4 2021-2023.

5 **VIII. ILLUSTRATION OF PUBLIC SERVICE SAVINGS BUILDUP**

6 **Q. Have you analyzed the level of savings that the Company could expect to achieve**
7 **that incorporates the forecasting and programmatic changes you identified?**

8 A. Yes. I provide a revised achievable potential savings scenario in Figure 26, below. In this
9 scenario, without accounting for underestimation in other program areas, I estimate that
10 the Company can achieve portfolio level savings of 590 GWh in 2019, 688 GWh in 2020,
11 and then average annual savings of 496 GWh during the period 2021-2023:



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2

Figure 26: Revised Public Service Electric Energy Savings Goals

3

Q. Please summarize the increases in achievable potential that you identified for each of the program areas that you identified.

4

5

A. The increases in achievable potential that I have identified are provided in Figure 27

6

below:

| | 2019 | 2020 | 2021 | 2022 | 2023 | Total |
|---|------------|------------|------------|------------|------------|--------------|
| Navigant Potential Study (Alternative Lighting) | 348 | 395 | 329 | 302 | 267 | 1,642 |
| Residential LED Adjustments | 138 | 174 | 35 | 43 | 48 | 438 |
| Commercial Lighting Adjustments | 34 | 49 | 79 | 84 | 91 | 336 |
| Strategic Energy Management | 35 | 35 | 35 | 35 | 35 | 175 |
| Residential HVAC Midstream | 10 | 10 | 10 | 10 | 10 | 50 |
| Emerging Tech | 25 | 25 | 25 | 25 | 25 | 125 |
| Revised Annual Energy Savings Potential | 590 | 688 | 513 | 499 | 476 | 2,766 |

Figure 27: Available increases in Public Service Achievable potential compared with Alternative Lighting Scenario

Q. Based on your analysis of the total increase above the Company’s proposed targets that you believe to be achievable, what are the targets that you recommend?

A. The energy savings targets that I recommend for the Commission to establish for the Company are shown in Figure 28 below. The proposed savings targets are based on my assessment of the achievable potential, and are responsive to the mandate of the Governor’s Executive Order:

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|--|------|------|------|------|------|
| Public Service Proposal | 350 | 350 | 325 | 325 | 325 |
| Revised Achievable Potential | 590 | 688 | 513 | 499 | 476 |
| NRDC and Sierra Club Recommended Targets | 550 | 575 | 500 | 500 | 500 |

Figure 28: Revised Achievable Potential and Recommended Savings Targets

1 **Q. In your view, should the Company implement its proposed geo-targeting approach**
2 **to DSM programs as outlined in its filings?**

3 A. Yes, with a caveat. My experience, and the research I conducted in writing the report
4 referenced above, have convinced me that given sufficient lead time energy efficiency
5 can be an effective tool for deferring certain demand-related infrastructure investments,
6 and that it can save ratepayers significantly compared with T&D investments. However, I
7 am concerned that when the Company says that “By concentrating DSM marketing and
8 outreach efforts on specific geographical areas with significant system constraints, the
9 Company can maximize benefits to all customers,”⁸³ it may be implying that a natural
10 consequence of this will be to reduce the availability of DSM in non-targeted areas. I do
11 not believe that a geo-targeting approach used in place of broad-based DSM programs is
12 either in the best interest of ratepayers, or consistent with the Governor’s Executive
13 Order. Broad-based DSM is beneficial on a system-wide basis, and I have demonstrated
14 that there is significant potential for the Company to deploy aggressive DSM programs to
15 the benefit of its customers. However, the Company should pursue geo-targeted DSM in
16 addition to its broad-based programs when it can be used to defer more costly
17 infrastructure investments.

⁸³ Public Direct Testimony and Attachments of Donna A. Beaman, p. 3.

1 **Q. Are there any specific recommendations that you would make to the Company for**
2 **how it should consider whether geo-targeting is appropriate for addressing specific**
3 **constraints?**

4 A. In our report on using geotargeted energy efficiency to defer T&D projects we make
5 several recommendations based on our research. We found that sufficient lead time is
6 critical when identifying T&D projects that could potentially be deferred through energy
7 efficiency, to ensure that planning and implementation of so-called non-wires alternatives
8 can be executed. This calls for a systematic approach that identifies projects that have the
9 potential to be deferred and assesses them as a regular course of business. The Company
10 proposes to incorporate geo-targeting planning into its current five-year planning horizon.
11 This is good, but I would suggest that the Company and Commission consider assessing
12 distribution upgrades and DSM alternatives on a ten-year planning horizon to make sure
13 that the longer lead times that may be required for DSM alternatives do not preclude
14 deferral projects from being implemented. It would be disappointing to find that a DSM
15 alternative could have been used to defer a project had there been more time to deploy it,
16 but that insufficient time made it necessary for ratepayers to invest in more expensive
17 traditional solutions.

18 Several jurisdictions that have implemented systematic planning for non-wires
19 alternatives have found that establishing criteria around the minimum size of projects to
20 consider is also important, to ensure that planning costs don't overwhelm the potential
21 savings. The Company's proposed \$500,000 minimum project cost addresses this point.

X. RECOMMENDATIONS

Q. Based on the evidence you provide above, what are your recommendations for the Commission?

A. First, I recommend that the Commission reject the Company’s proposal to reduce its energy savings goals. I have shown that doing so would be inconsistent with Governor Hickenlooper’s Executive Order, that the Navigant potential study significantly underestimates the achievable savings potential—especially in 2019-2020— and that the Company has underestimated its ability to achieve savings, and overestimated the costs of saving energy, so consistently that the pattern should be used as evidence that it can achieve 15% more with the available budgets than it projects.

In place of the Company’s proposed energy savings targets I recommend that the Commission require the Company to maximize energy savings for its customers, consistent with the targets I have proposed, and which are reproduced here for convenience:

| | 2019 | 2020 | 2021 | 2022 | 2023 |
|--|------|------|------|------|------|
| Public Service Proposal | 350 | 350 | 325 | 325 | 325 |
| Revised Achievable Potential | 590 | 688 | 513 | 499 | 476 |
| NRDC and Sierra Club Recommended Targets | 550 | 575 | 500 | 500 | 500 |

Figure 29: NRDC and Sierra Club recommended energy savings targets

Second, I recommend that the Commission ensure that in pursuing these increased savings, the Company continues to provide ample opportunities for all customer segments. Under-served markets that the Company should provide more opportunities for

1 include the Company's most vulnerable customers, such as those residing in low income
2 multifamily housing.

3 Third, I recommend that the Commission approve the Company's request to use geo-
4 targeted energy efficiency where it can cost-effectively defer T&D investments, with the
5 caveat that the Company should use geo-targeting in addition to broad-based DSM
6 programs, rather than in place of them.

7 **Q. Does this conclude your testimony?**

8 **A.** Yes, it does.